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Technical World Magazine

HENRY M. HYDE, Editor

Contents for September, 1910

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Technical World Magazine

FOR OCTOBER

¶ The following partial Table of Contents for the next number of the Technical World Magazine is subject to change. Some articles here listed may be postponed to later issues and many new and important articles will be added.

Age of the Spinning Top

By ARTHUR B. REEVE

¶ How the child's toy, which runs on a string, has been made to keep a railroad train balanced on a single track, to help aeroplanes conquer the tempests and to keep ocean steamers on an even keel, in spite of high winds and waves.

People Who Live in the Dark

By BAILEY MILLARD

¶ In New York there are 100,000 living rooms without windows. What the Metropolis is doing for its half million cave dwellers.

Policing the National Forests

By HENRY M. HYDE

¶ Romantic and adventuresome life of the rangers who keep watch and ward over the great public forests. Big game hunters, mountain climbers, frontier sheriffs, and foresters—all in one.

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¶ Every issue is a moving picture show of the world's progress. The Panama Canal up to the minute—wonderful new photographs of the African Falls that dwarf Niagara. One hundred and fifty other photographs from life.

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¶ Little bits of new and interesting information from all over the world—strange, startling, and fascinating glimpses into research laboratories, experimental rooms and recently explored corners of the earth. All made clear in snap-shots and text.

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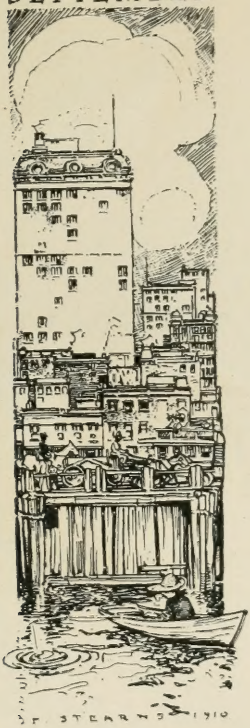

A TRAM "THRILLER" UP THE MOUNTAINSIDE, FROM SILVER PLUME, COLORADO.

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THE TECHNICAL WORLD MAGAZINE

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DEATH AND THE AIRMEN

By

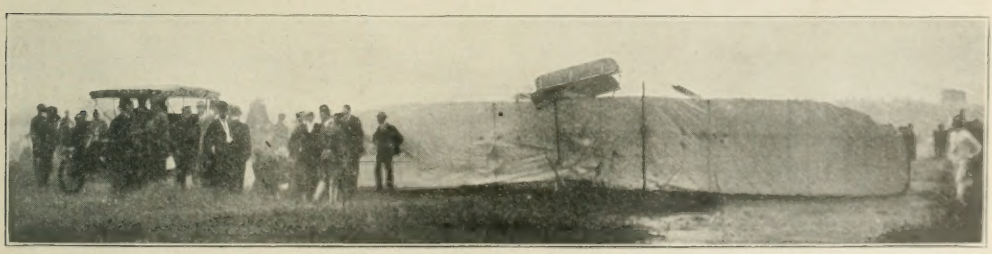
BAILEY MILLARD

"SEE that hawk up there," said Dr. Alexander Graham Bell to me at his flying machine station near Baddeck, Nova Scotia, three years ago. "He has learned to fly, but he has never risked his life. I don't believe there is any necessity in risking human life in learning how to fly heavier-than-air machines. I have always considered the experiments of the Wright brothers very dangerous, as, indeed, they have proved."

As Dr. Bell has spent more money than any other man in America in perfecting his flying machines, he is certainly entitled to a hearing on this important point of the risks of aviation. In all of the thousands of successful tests made of his machines at Baddeck not a life has been lost and not a limb broken. Dr. Bell regards the many recent sacrifices of life to the science of aviation as not only unnecessary but silly.

The appalling list of fatalities in flying heavier-than-air machines during the past two years might all have been prevented if the canny Scotch caution of Dr. Bell had been shared by other aviators. But man is prone to take risks, and some men, like Hamilton, Baldwin, and Paulhan, positively delight in them. Hamilton, the greatest dare-devil of them all, thinks nothing of plunging a thousand feet at the rate of sixty miles an hour and, just as his plane seems about to crash into a terrified crowd, of scooting up into the air again with a grim smile upon his face.

They will tell you in the Aero Club that these reckless drivers are all fore-



THE WRIGHT ACCIDENT AT FORT MEYER IN WHICH LIEUTENANT SELFRIDGE WAS KILLED.

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doomed to early death, that Hamilton, for example, cannot possibly survive the year unless he gives up the sport; and yet, strange to stay, death has chosen few of the dare-devils, though several of them have had awful falls, for instance, Charles Baldwin, who fell sixty feet at Hempstead, Long Island, and one hundred and fifty feet at Springfield, while Hamilton reckons his falls at a total of 10,645 feet, and he is still falling!

In seeking the conquest of the air, fourteen aviators have been killed since the middle of September, 1908. The first of these was Lieutenant Thomas E. Selfridge, who fell with Orville Wright at Fort Meyer, near Washington, D. C., on the seventeenth of that month. Selfridge had been schooled to caution by Dr. Bell, and when I talked with him at Baddeck, a year before his death, on the risks of aviation he told me that he intended always to take as few chances as possible.

"There will be a good many aviators killed before we master this business," he said, "but I'm not going to be one of them."

He thought that in going up with the shrewd, careful, Orville Wright, he was perfectly safe, and so he was in all that depended upon driving skill. His death was due to a mechanical defect in the aeroplane. The fatal flight was made in the afternoon above the parade ground at Fort Meyer. The aeroplane had made three circuits of the parade ground at heights varying from sixty to a hundred feet when suddenly a propeller blade snapped short off and was hurled sixty feet away. Tipping slightly for a second or so, the

WRECK OF PLANE IN WHICH CAPTAIN FERBER WAS KILLED AT BOULOGNE.

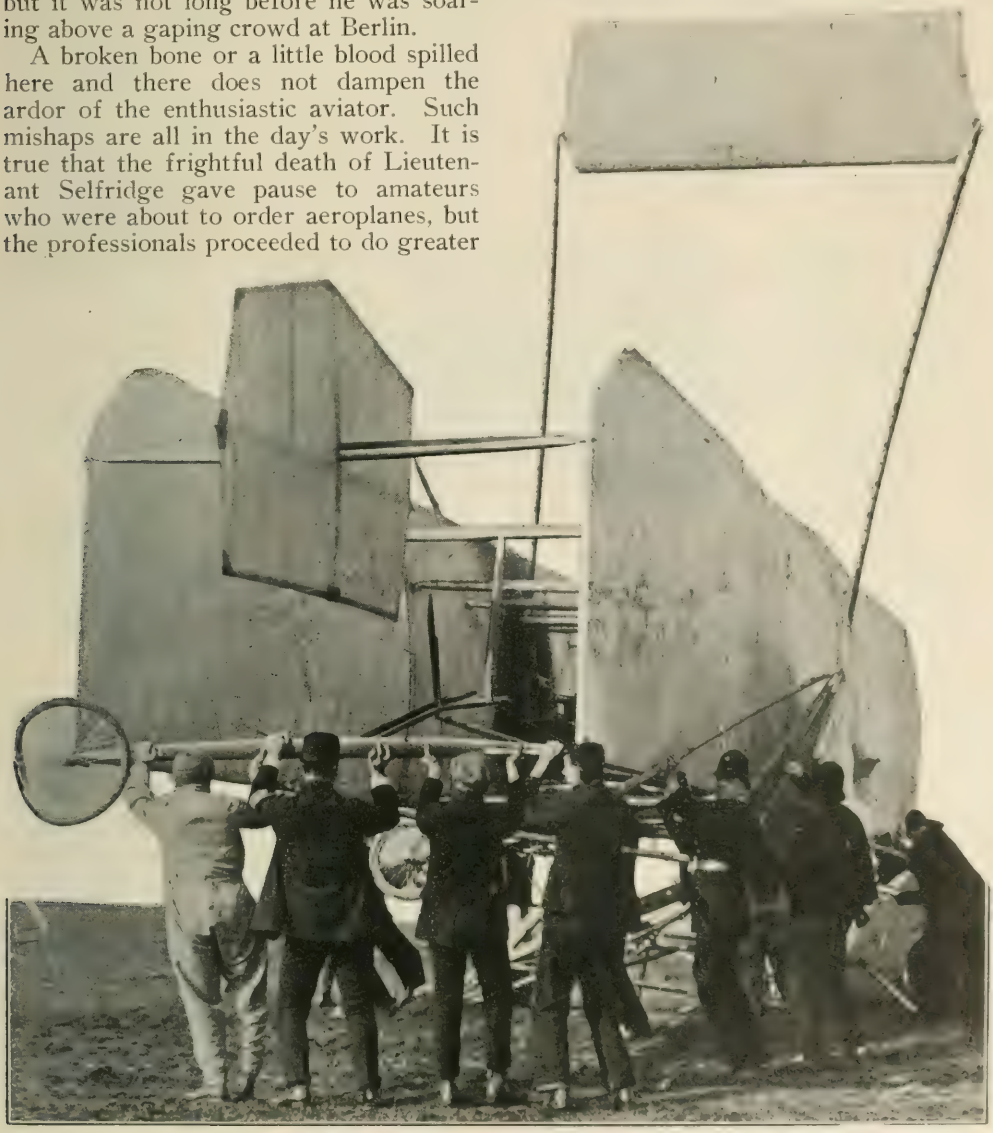
FOURNIER'S FATAL SMASH.

aeroplane soared upward for ten or fifteen feet, then it gave a sharp dive and crashed straight down into the field seventy-five feet below. For a moment the crowd could not see the plane, as the dust arose in a blinding cloud. Then a rush was made for the machine and several powerful men lifted the engine and gas tank off the crushed and prostrate body of Selfridge, who died soon afterward. Wright escaped with minor injuries. It was predicted at the time that the inventor would never fly again, but it was not long before he was soaring above a gaping crowd at Berlin.

A broken bone or a little blood spilled here and there does not dampen the ardor of the enthusiastic aviator. Such mishaps are all in the day's work. It is true that the frightful death of Lieutenant Selfridge gave pause to amateurs who were about to order aeroplanes, but the professionals proceeded to do greater and still greater deeds of daring in the unstable ether.

On the same day that Selfridge and Wright took their tumble, Rene Gasnier, the French aeroplanist, met with a bad accident. The connecting rods of his planes broke and the machine crashed down thirty feet. The aeroplane was completely wrecked and Gasnier was badly hurt about the head.

September has been a fatal month for the aviators. Besides the death of Lieutenant Selfridge in that month, three



CODY COMES TO GRIEF AT DONCASTER, ENGLAND.

A. P. Rowe Had a Bad Fall at Wembly Park, England.

other airmen had fatal falls in September, 1909, the first of these being Eugene Lefebvre, the daring young engineer, who astonished the crowds at Rheims and who made a series of brilliant flights in Wright machines, near The Hague. Lefebvre's was the first fatal accident in the history of French aviation. He was known as a daredevil and had been fined four dollars for reckless driving at the aviation meet at Rheims—four whole dollars!

But he was not doing stunts at the time of his fatal fall, the cause of which still remains a mystery. He had left the ground easily in a Wright machine and was flying around the aerodrome in the aviation field, making the turn gracefully at a height of twenty feet, when suddenly and most unexpectedly the aeroplane tilted sharply downward and struck the ground with great violence. Lefebvre was pitched out upon his head and lay unconscious amidst the wreckage. He died in a few minutes.

On the same day, Enea Rossi, an amateur, while flying a machine of his own invention, near Rome, was precipitated to the ground because of some defect in the mechanism of his aeroplane and was instantly killed.

Graham White's Aeroplane Collides with a Motor Car in a Gale.

While finishing a series of flights at Boulogne on the twenty-second of the same month Captain Louis F. Ferber, the well-known aviator, was suddenly eliminated from the list of contestants at the next big meet by a fall that thrilled his French spectators, while all tongues were mute with terror.

On the previous night, at a dinner given to the Mayor of Boulogne, Ferber said most prophetically: "The tribute of more lives will be given to the science of aviation before it is completely mastered."

Ferber's accident was simplicity itself and might happen easily to any aviator any time. As he slowed the machine and brought it closely to the ground, one of the wings struck sharply, causing the plane to turn turtle in a light breeze. The unlucky driver was pinned beneath his motor, the weight crushing out his life almost instantly.

Bleriot has had a number of September mishaps again. One of his unlucky adventures was at Brescia, Italy, last September, when his aeroplane banged against a tree and the propeller was smashed. In none of his accidents, however, has this doughty channel flyer ever been seriously injured.

It was in September, five years ago,

Eugene Lefebvre's Fatal Wreck.

that Hamilton fell 4,200 feet when the gas bag of his dirigible balloon burst over Paterson, New Jersey, and he lit upon the soft side of a hotel, being knocked unconscious, while the scurrying guests were wondering what kind of an aerolite had crashed through the roof, said aerolite being Mr. Hamilton's gas engine.

Nobody in the world has more need of caution and careful preparation in an adventure than the aviator. Everything about his aeroplane and engine must be in apple-pie order before he ventures aloft, and yet the silliest risks are sometimes taken. For example, the accident which was the cause of the death of Antonio Fernandez, at Nice, in December last, was the direct result of carelessness on the part of that foolhardy plane driver. Impatient of delay and despite expostulations of his mechanic, Fernandez tied up a stay-piece with a bit of common twine. Of course, the string broke, resulting in the sudden tilting of his planes. Despite this manifest flaw, Fernandez essayed a sharp turn to gain a few more plaudits from the populace. In a twinkling his machine turned turtle and took a long Phaeton-fall to the earth, the aviator's head striking so hard as to be buried in the soft ground. Life was extinct when they picked him up.

"Fernandez the vain," they called him in Nice and, indeed, he had that to be vain of, for he was one of the handsomest men in the town. He was a popular ladies' tailor, and some of his best customers fainted when they saw him fall out of the sky. Just why his vanity should have led him from the construction of blouses and skirts to that of aeroplanes nobody knows, but he was so thoroughly convinced that the machine he had built was better than the Wrights' or Curtiss' that no aviator dare make a suggestion to him.

THE *Zeppelin II* DEMOLISHED BY THE WIND.

THE WRECK OF THE *Gill-Dosh*.

While two million of us were waiting along the shores of the Hudson last September for the weather-wise Wilbur Wright to make up his mind whether or not he would venture aloft in a ten-mile wind, we became greatly impressed with the idea that when the air was in motion no aviator should try to fly. But since then, Curtiss has broken two world's records in one day in a twenty-mile wind and Hamilton hardly glances at the bending tree-tops to note whether or not a gale is blowing. In one respect, driving an aeroplane is like sailing a catboat—it is the squalls that count. It was a squall that killed Leon Delagrange at Bordeaux last winter. Delagrange was one of the most noted experimenters in plane flying, being a pioneer, in fact, in that line. His experience had taught him that there was no particular danger in light winds. On the day of his death he ventured forth in a Bleriot monoplane in a twenty-mile wind at Bordeaux.

ACCIDENT TO ST. CALDERRAS' WRIGHT MACHINE AT BRESCIA.

WRECK OF THE BLERIOT MONOPLANE.

When he had made two turns around the course, a sudden gust struck the machine and the crowd was horrified to see it sway and tilt at a dangerous angle. Then followed one of the most thrilling exhibitions that has ever been witnessed in aviation—a fight for life with the wind. The crowd was dumb with the sense of the obvious peril of the aviator as he tried by every means in his power to swing his machine to an even keel. Inch by inch he drove it forward through the air against the wind in his endeavor to right it, while the terrified crowd watched the wings straining out of their sockets. Just as the plane seemed to be settling to a safe angle, a loud report was heard, and the left wing, carried clean away, came whirling down sixty feet, followed by the unbalanced machine which struck the earth with a crash. The huge propellor churned round in the earth for some seconds, tearing itself into splinters and sending up a cloud of dust. The motor was still running when it was lifted off from the luckless aviator whose death had been instantaneous.

Scathless through many dangers had flown the doughty Delagrange, a man admired and envied by many airmen, a maker of records, a dauntless devotee to aviation, the third man in France to make a public flight in an aeroplane, and yet a victim, "a martyr," as the French enthusiasts call him, to the most ambitious of all sciences.

Delagrange fell but sixty feet. In the same month Hubert Latham, another French aviator, fell one hundred and fifty feet at Heliopolis and got up and walked away! His monoplane was wrecked. It is not how far you fall, but how you fall and what happens to be atop of you when you alight that counts in this tumbling business, which, as is shown by the experience of every professional plane driver, is a positive feature of present-day aviation. To a layman it would seem that the best way to do, if you have to fall, is first to select a perfectly safe, soft spot and land on that spot.

Hubert Le Blon did not select a soft spot for his tragic tumble. He fell on the rocks at San Sebastian, Spain, and was, of course, instantly killed. Poor Le Blon! His was one of the most tragically spectacular of all aeroplane falls. He was circling the Royal Palace at Miramar in an exhibition flight that was full of thrills because of its sharp turns and sudden dives. The crowd had been holding its breath like so many diving seals when suddenly it gasped to see the machine tilt sharply at a height of one hundred and fifty feet. At that moment the engine broke down. Though at an extremely dangerous angle, Le Blon attempted to glide back to the shed. But the machine kept turning, and soon swooped with terrific force upon the rocks. Madame Le Blon, who was among the spectators, ran shrieking toward the prostrate body of her husband,

and throwing herself upon it, kissed the gashed and bleeding face repeatedly and refused to be led away.

Ah, the wives of these aviators! Has an aviator, in the present stage of the progress of the science any right to have a wife? In asking this question I refer more particularly to the aviator who is out for laurels, in the flimsy machines built for making records, where strength is sacrificed for lightness and high power engines. And yet, as I write there lies before me a newspaper clipping that tells of the plans of one, Schneider, a New York man, who has built an aeroplane in which he intends to take his bride on their honeymoon journey. Schneider's machine fell a few months ago and he was badly bruised. The young woman who is to marry him was the first to reach his side after the accident and she nursed him back to strength. And now for the honeymoon voyage in high air.

BARONESS DELAROCHE INJURED AT RHEIMS, JULY 8.

When plane-flying gets into the blood of a man or woman, the desire for farther and farther flights becomes a positive mania. Not all wives, however, are like Mrs. Clifford B. Harmon, who, after her husband's Rosyln accident, in which he glided into a tree and thus saved his life, met him with an expectant smile and asked:

"Didn't you fly?"

"Yes," was the reply; "but it looked like I was going to fly into eternity, so I came down. I had an accident."

"Well," said the unperturbed wife, "you must try again."

Complete loss of the control of an aeroplane is a common cause of accidents. Chauvette Michelin, a young aviator, rose from the field at Lyons in May in an Antoinette monoplane and had barely begun his flight before he lost control of his steering gear and banged into a derrick.

LIEUTENANT SELFRIDGE READY TO START ON HIS FATAL FLIGHT.

The Wreck of the Zeppelin Dirigible.

The machine knocked the derrick over and it fell upon him, fracturing his skull. Michelin had always had a great dread of accidents, and because of several minor mishaps he had told his friends he was going to give up flying. To an assistant, as his aeroplane rose for its fatal flight, he said: "No more aviation for me after this meeting. I have had enough." Prophetic words!

The summer of 1910 which witnessed more flights than any other season in aviation history had, of course, more fatal accidents. The first of these was that which befell Eugene Speyer, a seventeen-year-old lad, the son of a wealthy widow in San Francisco, on June 17th. Speyer fell from an aeroplane glider attached to an automobile. Towed gliders are becoming quite popular in some parts of the country. It was from such a glider that Israel Ludlow, the New York attorney, fell a few years ago and was crippled for life.

On the next day after the Speyer tragedy, J. Robl of Munich, while driving a Farman biplane, fell two hundred and fifty feet at Stettin, Germany, and was literally dashed to pieces.

It is not always the man in the machine that is killed in an accident. M. Blanc attempted his first flight in a Bleriot machine at Juvisy on the same day that Count de Lambert was thrilling the crowds that saw him soar above the Eiffel Tower. Soon after ascending, Blanc's monoplane, as the result of a false shift of the rudder, dived into the crowd that was watching the flight, mortally wounding a woman and injuring a dozen other persons. To be in a crowd at an aviation meet is not to be in the safest place in the world. Hamilton, who loves to tease as well as to thrill onlookers often has made sudden dashes toward people to see them take fright and dodge away. If ever he makes as bad a calculation in crowd-skimming as he did in pond-skimming out West, when his machine ducked beneath the water and he had to swim ashore for his life, he may be responsible for the death of more than one sky-gazer.

The wire stays of the Antoinette monoplane, in which Charles Wachter was flying at Rheims on July 3rd, parted and the aviator fell 500 feet to the ground amid the wreck, dying instantly.

Nine days later Captain Charles Stewart Rolls, the most scientific and prominent aviator in England, was flying near Bournemouth in his French-built Wright machine in which he had flown across the English channel and back in June and was almost instantly killed by a fall of thirty feet. Captain Rolls was participating in an alighting competition for a prize to the aviator landing nearest a stake in front of the grand stand. When at a height of fifty feet he saw that he was dropping too fast. To check his drop he tilted the plane attached to the front of the machine. The tremendous strain on the forward plane was too much for the framework which broke with a loud report and the machine plunged to the ground.

It will be recalled how the cablegrams recorded the chagrin of the English when Louis Bleriot flew across the channel, a feat that had been attempted more than once by Britons who had failed. After Bleriot's flight, Count de Lesseps followed easily and British chagrin turned to dismay. Were the Frenchmen to enjoy a monopoly of channel-crossing? This would never do. Great were the rejoicings when Captain Rolls made the trip from Dover to Calais and back, a distance of forty-two miles, in ninety minutes, without stopping, thus doubling the accomplishments of his predecessors.

The lesson of the Rolls tragedy should be a salutary one to every aviator who undertakes the kind of stunts essayed by Hamilton, where too great and sudden a strain is put upon any portion of the machine. It was agreed by all experts who witnessed the fall of Rolls that he tried to check his descent too quickly. The Wright aeroplane is a very rapidly acting machine and responds with astonishing readiness to the slightest movement of the manipulator. Such an accident should make other aviators of this and other quick-acting machines more careful. But will it? Every day one reads of desperate risks and awful falls taken by experienced drivers—men who have never been prone to recklessness and yet who meet with accidents due to unusual strain upon some part of an aeroplane.

The Canadians have taken a great interest in aviation and have made many flights, but with few accidents. In

When the Aviator Strikes the Ground.
Schneider in the wreck of his aeroplane.

THE VOISIN BIPLANE OF BARONESS DELAROCHE AFTER HER ACCIDENT.

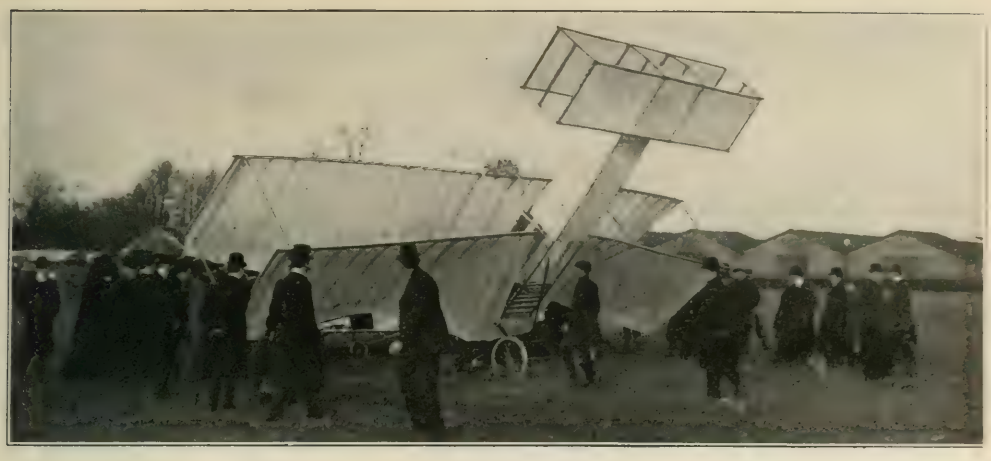
Manitoba, Eugene Ely in his third attempt to fly between Winnipeg and Portage la Prairie on July 16th, fell several hundred feet and was picked up badly injured.

It would be difficult to recount the deaths in ballooning and dirigible airship flights. The tragic and mysterious disappearance of Andree, the North Pole seeker, was among the most notable of these. Santos-Dumont came near to death at Passy when his dirigible landed on a roof, and he has had numerous accidents in airships and aeroplanes.

The worst disaster in airship history was that of Oscar Erbsloeh, the German aeronaut, who won the international balloon race at St. Louis three years ago. On July 13th, Erbsloeh, accompanied by Herr Toelle, a manufacturer; Engineer Kranz, Engineer Hoeppe, and Motorman Spiches, were sailing in the dirigible balloon *Erbsloch* at a height of over 500 feet, when suddenly the great gas bag burst and dropped to the earth a crumpled mass. In such cases, aeronauts generally rely with confidence upon the parachuting tendency of the burst balloon to let them down lightly, but in this case the descent was so rapid as to cause all of the five persons in the balloon to strike the ground with great violence, killing every one of them.

As for Count Zeppelin, he has achieved

GRAHAM WHITE'S AEROPLANE SMASHED AT BROOKLANDS WHILE CARRYING LADY ABDY AND THE AVIATOR



THE WRECKED AEROPLANE OF DELAGRANGE.

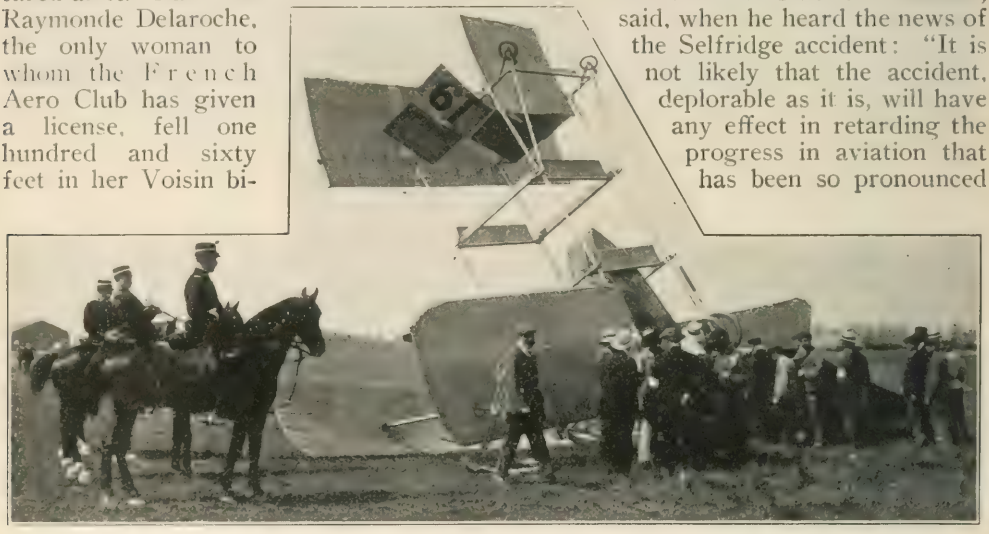
the construction of the huge passenger airship *Deutschland,* which for a short time last summer made regular trips between Friedrichshafen and Dusseldorf. As many as twelve passengers were carried at a time in this great air voyager and it looked as though common carriers would soon be making such journeys from place to place all over Europe and America. But lo! just as the hopes of the enthusiasts who had predicted such a state of things were at their highest and the newspapers were publishing accounts of the passenger flights, the wind, that old enemy of the aeronaut, settled the fate of the *Deutschland* by dashing it to earth, and luckily it was that the fall of the passengers was broken by the trees against which the airship was hurled in its downward drop.

But not the *Deutschland* disaster nor any other that may occur in future years will daunt the soul of man who has determined to conquer the air, and conquer it he will. The spirit of the age places a high premium upon the deeds of all these daring ones, and nothing leads a man on in war, aeronautics, aviation, or any other dangerous pursuit like the plaudits of the multitude. When four French officers met death in the military dirigible *La Republique,* wrecked near

THE WRECK OF THE MACHINE IN WHICH WACHTER WAS KILLED AT RHEIMS, JULY 3.

Moulins, the cross of the Legion of Honor was, all too late, pinned to the breast of each of the daring dead. Too late? Yes; but think of the effect upon other French aspirants for aeronautic and aviatory honors! Surely it has stirred them out of themselves in their efforts toward the conquest of the air.

Thus far, few women have been victims to the science of aviation. This, of course, is because they have rarely ventured aloft. Baroness Raymonde Delaroche, the only woman to whom the French Aero Club has given a license, fell one hundred and sixty feet in her Voisin biplane at Rheims on July 8th. The Baroness was considered a woman of great nerve, but for once she lost that nerve. Frightened by the approach of two aeroplanes, and while fumbling frantically about the machine, she shut off the power. For a few moments her biplane glided on an even keel, then suddenly turned and dropped like a stone. The Baroness' legs and arms were broken, and she was otherwise injured, but at last accounts she was alive.



THE BRIGUET BIPLANE AFTER THE WRECK IN WHICH THE AVIATOR WAS INJURED.

Another aviator whose life hangs in the balance while I write is Alan Boyle, son of the Earl of Glasgow, who lost control of his monoplane at Bournemouth and fell from a considerable height. He was picked up unconscious, having sustained serious injuries about the head.

But accidents do not, as I have intimated, deter old aviators from taking new risks or new aviators from taking the same old ones. August Post, secretary of the Aero Club of America, said, when he heard the news of the Selfridge accident: "It is not likely that the accident, deplorable as it is, will have any effect in retarding the progress in aviation that has been so pronounced of late. The accident demonstrates that there are many things in regard to the mechanical features of aeroplanes that still need careful working out."

Well, two years have passed since Selfridge fell, and there seem to be many things about aeroplanes that still need careful working out. For aviators are still falling and unless they pick out safer places on which to fall than they have been doing lately, the list of fatalities will be a long one by the end of this greatest of all aviation years.

ALFALFA HARVEST SCENE IN KANSAS.

THOSE KANSAS CRANKS

By

HENRY M. HYDE

AS the train started to pull out across the bridge, the grinning porter came into the smoking room and began to gather up the drinking glasses.

"What's the matter now, George?" asked the fat man in the corner seat.

"Jes' gittin' ready for Kansas, Captain," the darkey grinned. "Every feller's got to furnish his own drinkin' glass in Kansas."

"Huh!" snorted the fat man. "Lot a damned cranks. Who ever heard of such a fool notion!"

An old man with a ragged gray beard and a shrewd blue eye looked up from his seat in the arm-chair. "I take it you're from New York?" he asked, innocently.

"Yes," growled the fat man with a contemptuous glance. "I'm from New York."

"Well," went on the old farmer, "do you New York fellers each have his own tooth brush? Or do all of you scrub your teeth with the same brush?"

The New York man sputtered in speechless indignation.

"You see," the farmer went on mildly, "a drinking glass that is used by everybody is just as bad as a public tooth brush. Tuberculosis, scarlet fever, and syphilis are three of the many diseases which can be and

F. D. COBURN.
A state official who declined an appointment as United States Senator because he preferred to stay at home and write poems on pork and odes on oats for a lot of farmers!

"KANSAS: WHERE THE COWS ARE FAIRLY ACHIN' TO GO ON WITH THE HOGS ARE RAISIN' BACON BY THE KEG."

often are, passed on from one person to another by the use of public drinking glasses. So we cranks out here in Kansas, passed a law forbidding them in the state."

The New York man jumped up and stalked out of the smoking room. "And we are not alone either," the Kansan added. "They've got the same law in Oklahoma and down in Texas. There *are* a lot of cranks out in this country." Then he smiled as if he enjoyed the title.

Kansas has always been the singed cat in the sisterhood of states. Fifty years ago, its present place on the map was marked by a shaded rectangle with the legend "Arid Plains." And in the mind of the elder generation, Kansas is arid still, in spite of the huge harvests which have made its farmers rich. The border wars gave the young territory the grim nickname of "Bleeding Kansas" and a lurid haze still hangs over the state when the casual eastern eye encounters it on the map. In more recent years Kansas has suffered from plagues of grasshoppers, Populists, whiskers, mortgages, humorists and fiction writers of the Dodge City and Sod House

A Kansas Farmer in His Alfalfa Field.
When a new idea comes along that seems to promise improvement in living conditions, Kansas people meet it at the front gate.

RECORD BREAKIN' AND

schools. So that today when the man in the street thinks of Kansas he winks at himself in the mirror and grins. Kansas! What a joke!

Meanwhile if the man on the street, particularly if he lives east of Chicago—could take even a hurried trip through Kansas, he would certainly realize that the joke is on him. He would be impressed, first of all, by the exceeding richness and prosperity of the state.

After running for miles through alfalfa and corn fields, as thick and lustrous as green velvet, he comes suddenly into a trim and handsome city, with great maple and elm trees arching over wide, clean streets. He will see, with something like a gasp of surprise, that the rolling prairies are broken by high hills and clumps of big trees, and cut by rivers and winding creeks.

Getting off the train at some small Kansas town, with visions of cyclone cellars and sod houses in his eye, he will be met by a smart page in buttons who carries his suit case across the street to a handsome hotel in the English timbered style, where the service and table is within five points of perfection. Then, when he orders his cocktail before dinner he will be told that Kansas is a prohibition state. And presently one of the most startling and important things about Kansas will begin to impress itself on him:

Kansas is one state in the Union where the laws are actually enforced.

The casual guest winks at the page, hands him a quarter and says that of course he knows Kansas is a prohibition state but that he wants a cocktail just the same. Deftly pocketing the quarter,

BOY LOST IN A KANSAS CORNFIELD

the page regrets that a cocktail is impossible. His statement is endorsed by the manager of the hotel. The prohibition law is really enforced in Kansas. So are the other laws. No wonder the State has a reputation for crankiness!

Irrespective of the views of the visitor on the subject of personal liberty and

prohibition, he can not but be impressed by the fact that the wonderful progress and prosperity of Kansas has been achieved under the operation of the prohibition law. In the last ten years the bank deposits of the state have jumped from $70,000,000 to $190,000,000 and since the law has been effectively and completely enforced, the growth of business has been even more rapid. Fifty-seven out of the one hundred and five counties of Kansas are without a pauper, eighty-seven have no insane person and the death rate of the state is the lowest in the world—seven and one-half per thousand. Woe betide the advocate of an occasional cocktail if he tries the temper of one of those Kansas cranks.

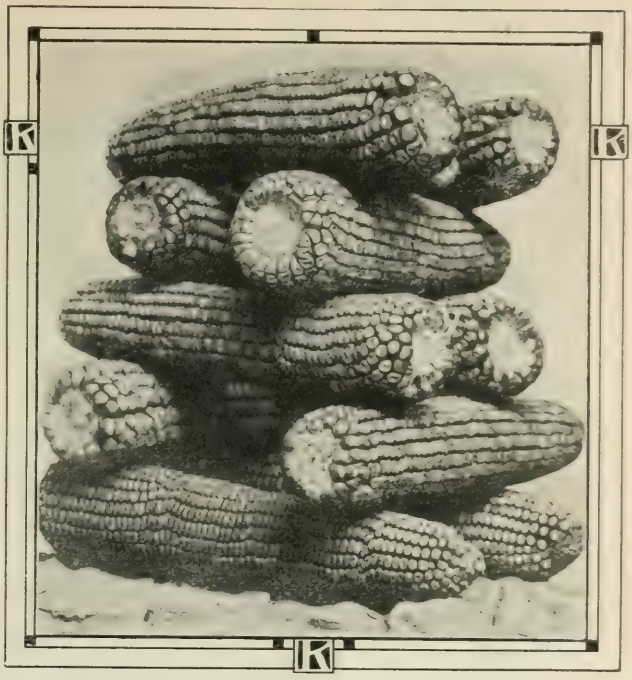
How Men Like William Allen White, Who Could Get Jobs on New York Magazines and Really Seem to Have a Certain Degree of Refinement, Can Willing ly Stay in Kansas is Beyond All Understanding!

Presently it may begin to dawn on the reluctant Eastern visitor that the chief reason why Kansas is considered so queer and cranky is the mental alertness of its people. A new idea is the most alarming thing in the world to the average man. And when a state produces an annual crop of new ideas and puts most of them into practical service, it is no wonder that smug and conservative self-complacency is shocked into a fit. Kansas people, while properly proud of themselves and their achievements, have never been self-satisfied. They have always been trying to im-

A FARMER'S AUTOMOBILE PARADE AT A CENTRAL KANSAS

prove. The New York man who feels that any attempt to improve on Broadway would be sacrilegious, naturally cannot appreciate "the state of mind" which is Kansas.

What other people, for instance, ever produced a state official who declined an appointment as United States senator because he preferred to stay at home and write poems on pork, odes on oats, and sonnets on alfalfa for circulation among a lot of farmers? F. D. Coburn is the Kansas Horace and the bulletins which are issued by the Kansas State Board of Agriculture under his direction, are so different from any other similar documents as to raise all



KANSAS CORN.
This twenty ears of corn weighed twenty-seven pounds, four ounces.

COUNTY FAIR.

sorts of suspicions in the commonplace mind of an ordinary dry-as-dust, agricultural expert. Coburn's productions are bound and printed in the style of art booklets and bear such alluring titles as "Alfalfa's Affinity," "The Hog's Happy Habitat," and "The Lay of the Helpful Hen," also the convincing facts and figures which Coburn knows so well how to present, are spiced with bits of verse—all, like the hogs and poultry, native products of the Kansas soil. First is printed a table, showing that according to the national government an average Kansas hog is worth more actual cash than a porker from any other state in the union. Then, just below the figures, Walt Mason, the Emporia bard, bursts into song:

"Kansas: Where we've torn the shackles
From the farmer's leg;
Kansas: Where the hen that cackles
Always lays an egg;
Where the cows are fairly achin'
To go on with record breakin';
And the hogs are raising bacon
By the keg."

The significance of all this lies not in the fact that Mr. Coburn happens to be a man of literary tastes, with a graceful method of expressing himself, but in the really remarkable appreciation with which his outpourings are received by the mass of Kansas farmers. Nothing could be more eloquent of mental alertness and a high quality of general intelligence.

The reports of the Kansas State Board of Health may also be fairly classed as literary productions. Its inspectors and experts travel continually about the state, analyzing the water supply, printing boldly the constituents of patent medicines, making public the names and addresses of firms who violate the pure food law, keeping close track of contagious and infectious diseases and in every way helping the people to make what is already the lowest death rate in the world still lower. The results of their labor are printed monthly in a bulletin which is sent free to any citizen who cares to ask for it. And sprinkled about among the statistics and tables are quotations from Emerson and Carlyle, essays on Abraham Lincoln, and fugitive poems, selected with fine taste and discrimination.

Another thing which leads Eastern people to the conviction that Kansas people are cranks is the remarkable if misguided, unanimity with which Kansans continue to remain residents of their native state. To the typical New York man whose sole idea of heaven is the Great White Way, the fact that anyone should voluntarily and by preference live anywhere but on Manhattan Island is *primâ facie* and complete evidence of insanity. How men like William Allen White and Ed Howe, who could get good jobs on New York magazines, who have written famous novels, dined with

A KANSAS HOMESTEAD.

To the man whose sole idea of heaven is the great white way, the fact that anyone should voluntarily live anywhere but on Manhattan Island is *prima facie* and complete evidence of insanity.

JURY OF SHADELAND.
Hereford bull, another Kansas product.

presidents, and who really seem to have a certain degree of culture and refinement, can willingly stay in Kansas, is beyond all understanding! They are cranks—that's the only way to explain it from the Eastern standpoint.

Meanwhile, Kansas and its farmers keep on moving, growing bigger and richer and more intelligent. When a new idea comes along that seems to promise improvement in living conditions, the Kansas people meet it at the front gate and invite it in to take off its coat and have a bite to eat. They are all alive out in Kansas. Sockless Simpson, Carrie Nation and "Whiskers" Pfeffer were all Kansas products and the state is not ashamed of them. Each in his way served at least to focus public attention on some evil that might otherwise have remained unnoticed.

A state that leads the country in the production of wheat, with a corn crop vastly greater in value than the wheat: a state with the lowest death rate and the highest standard of intelligence; a state where people are more interested in changing their minds than in changing their clothes! Above the mellow hum which comes from behind the screen of sunflowers—it is the hum of Kansas poets, not grasshoppers—rises one clear voice:

Life's burdens bear the lightest,
Home fires burn the brightest;
Her friendships are the strongest;
And love's light glows the longest;
Out in Kansas.

THE TRANSATLANTIC LINER *MAURETANIA*, MADE BY WASTE GASES FROM COKE OVENS.

THE MAURETANIA—A BY-PRODUCT

BY

L. LAMPREY

WHEN the gigantic *Mauretania* makes her stately way into the harbor, or steams majestically out of the North River on her way to sea, there is nothing in her appearance to suggest the by-product—yet such she is. Her huge bulk is of steel, in whose manufacture waste steam was used, making energy equal in value to the steel itself. Though she was constructed but a stone's throw from the biggest coal-fired power-house in all Europe, the power which lifted her plates in place was derived, not from that power-house, but from waste gas captured in coke ovens, sixty miles or more away.

The ancient adage about carrying coals to Newcastle is proof enough that for centuries this Tyneside city has been, as she is today, the greatest coal export city in the world. Yet, while she exports more coal every year, less and less is used at home, within her own boundaries. And, paradoxically enough, this diminution in the use of coal is coincident with an industrial progress unequaled in all Great Britain. One of the chief products of the district is coke. The coke, as exported today, is as valuable as ever it was, but the industries of Newcastle take their toll of power before they pass on the residue to less fortunate communities. Newcastle can give a demonstration on conservation of energy that shows what really can be done when a nation has felt the pinch that comes of waning resources.

America is now in the throes of controversy over the conservation of natural resources. First the forests were sheared off with prodigal wastefulness, wood grew too dear to burn and coal took its place. When it became evident that the coal mines cannot last forever,

NEWCASTLE ON TYNE USES LESS COAL IN PROPORTION TO POWER PRODUCED THAN ANY OTHER CITY IN THE WORLD.

the cry rose "Save the coal by the development of our unused water power." Now comes the water-power question, and so the argument travels round and round, like a squirrel in a cage, with every new reform discussion and doesn't get anywhere. What is perfectly clear, however, is that when the power is exhausted we shall have to get it elsewhere or do without. This problem has confronted England for a long time, but she was saved preliminary discussion because she had no natural resources to waste. It is the same problem as ours, but worse. Having no forests to chop down and no water powers to use, England's attention is directed toward but one object—making coal go as far as it can. The aim is to get every ounce of energy out of every pound of coal. Electricity, as usual, is the agent used to accomplish this end, and one of the great power companies in northern England has gone so far as to generate less than fifteen per cent of its energy direct from coal. All the rest of its huge output comes from coal which has already performed its ordinary industrial service.

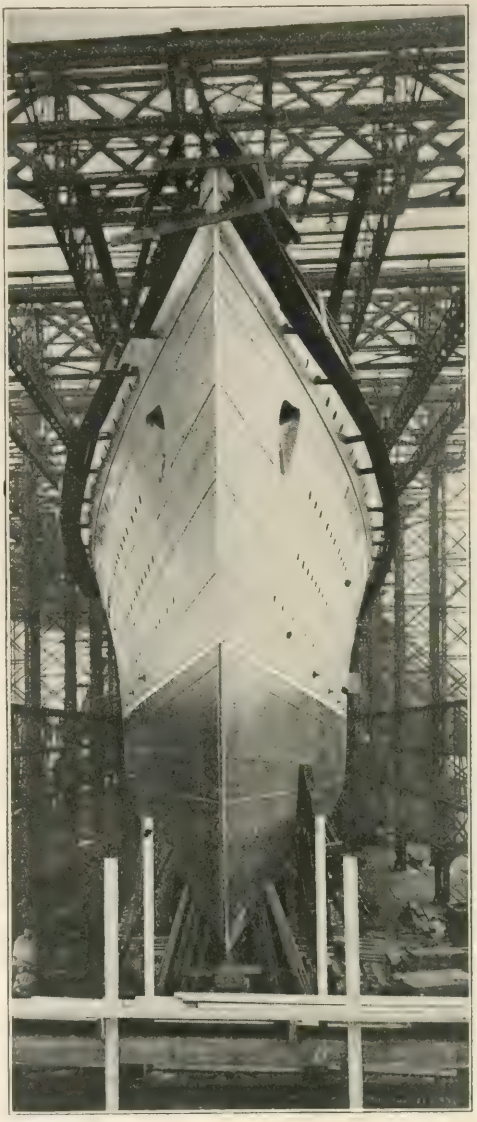
The advantage of getting energy from a pound of coal, instead of a pound of flesh and blood, is that the coal cannot be overworked. There is no eight hour day for coal. It can do a fair amount of work and blow off steam the rest of the time, or it can be made to do more work after it has performed that service.

One of this company's generating stations is at an iron works on the river Tees, where a tremendous amount of live steam is used in blast furnaces. For years this steam was allowed to blow off as exhaust, even though it contained an incalculable amount of energy. In devising methods for conserving the resources of the district, the power company set about to utilize the waste steam from these blast furnaces by transforming it into electrical energy. So now, when the steam has done its work in the blast furnace, it is not turned loose to shower the passer-by, but is piped across the yard into a steam turbine, where it becomes electric power, to be used perhaps fifty or sixty miles away in some Tyneside shipyard.

This new utilization is of no inconvenience to the iron works. In fact, it is a help, for now the steam is condensed by the power company and returned to the iron works as water, where formerly it exhausted into the air and was not recoverable in any form. The iron works, therefore, not only makes a profit on the steam sold, but has its water bill reduced as well, and the power company, of course, makes a profit on its own use of the waste steam. Thus, this live steam used in making the plates and ribs for the *Mauretania*, has become as valuable as those plates and ribs themselves. And, it still passes on to do other work and achieve other results quite as profitable as, though perhaps less spectacular than, the construction of a mammoth steamship.

In other cases—at collieries, for example—the waste gases in the manu-

facture of coke are captured and burned under boilers, creating steam which is turned into electricity. The utilization of these gases affects in no way the value of the coke, but it extracts enough energy, which formerly went to waste, to produce hundreds of thousands of horsepower to be used in the industries of the northeast counties. There is not a single shipyard on the River Tyne today which is not operated by electric power generated from waste heat. Every bit of mechanical power used in the construction of the *Mauretania* was created by forces which, ten years ago, were permitted to escape without any effort at utilization; every rivet was hammered by a force as intangible and elusive under old conditions as the fanciful Afrites and Genii of the Arabian Nights.



BUILDING THE *Mauretania*.

Newcastle has become the most cosmopolitan industrial city in the world. Instead of being simply a coal town, it has chemical works, shipyards, blast furnaces, rolling mills, machine shops, a dozen minor industries, and the natural corollary of tradesmen. The very object of the use of power is the displacing of the dollar-a-day man by the skilled mechanic. A town in which electricity is the motive power does not develop, nor use, the human being of the type of the "man with the hoe." In short, the utilization of waste power prevents the waste of human blood and bones and muscle in the old-time brutal fashion. Further than this, it tends to prevent the rolling up of a debt for the next generation to pay, in the shape of a crop of degenerates whose fathers and mothers were so overworked and underpaid as to raise children fit only to fill workhouses, hospitals, and jails.

Thus it has come about that Newcastle has become a great industrial center, and in becoming so, is using less coal in proportion to the power produced than is used anywhere else in the world, except perhaps under some of the great water powers. Newcastle's industrial supremacy today is due to its utilization of waste. Millions of tons of coke are being shipped, just as before, but before that coke is shipped it gives up great quantities of energy to turn the busy wheels of factories, shipyards, railways, and the city's thousand industries.

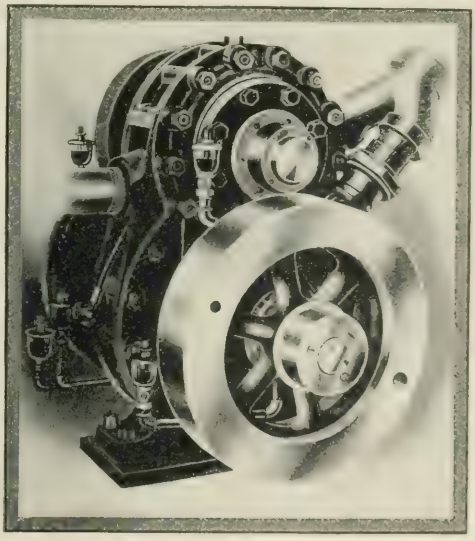
All this advancement has gone on without affecting the district's chief exports—coal and coke. The toll taken by Newcastle's industries does not lessen the value of the exports — it merely increases the usefulness of England's too few natural resources.

GREAT BANQUET TO NEW ENGINE

By

CHARLES FREDERICK CARTER

FOLLOWING the example of the conventional society bud the Herrick balanced rotary engine made its formal debut at a dinner given in its honor by its doting inventor and backer at the Waldorf-Astoria in New York last May. The engine was present not merely in a figurative sense but in its own material self in a ball room where, embowered in roses, it held a reception before the guests sat down to dinner. The sweet young thing did stunts for the edification of the company with its cover off, being turned slowly over by a dynamo so the folks could see just how it worked. The reports of the testing engineers, the log of its six months service run and its patents from every important country in the world were on exhibition, too. When everybody ran out of technical small talk the reporters were admitted and given lists of those present with the usual caution to spell the names correctly. The only departure from immemorial custom was the substitution of oratory for dancing after dinner.



Herrick Balanced Rotary Engine.

The Herrick balanced rotary engine seems to have been fully deserving of all the flattering attentions it received at its coming out, for even in the present stage of its evolution it promises to do remarkable things. For instance, Luther D. Lovekin, Chief Engineer of the New York Shipbuilding Company, a distinguished authority on marine engineering, gives it as his opinion that it will work a revolution in the art of driving high powered, high speed vessels of large size. By using Herrick engines in connection with turbines, and high pressure boilers with superheaters it would be possible, in the opinion of Mr. Lovekin, to increase the speed of vessels like the *Lusitania* and the *Mauretania* about one knot per hour without any increase in coal consumption. It should be remembered that to add a knot to any speed above twenty-one knots is a difficult and costly thing to do, the coal consumption increasing very much faster than the speed. To add another knot at present, to the 25.5 at which these giants are rated, without burning any more coal, borders on the marvelous. To maintain the present speed of the giant Cunarders the Herrick engine would effect a saving of twenty to twenty-five per cent in fuel, or about a thousand tons on each trip.

Perhaps it should be explained that while a steam turbine rotates it is not permitted to use the name "rotary engine." The turbine develops power by utilizing the velocity of steam blowing

against vanes on the periphery of disks. It runs at high speed and is fearfully wasteful except at one gait. A true rotary engine should develop from the expansive properties of steam exactly as a reciprocating engine does, only its piston should travel ahead in a continuous circle instead of churning backward and forward, and should be able to adjust itself to any load whatever without wasting steam. Moreover, it should be reversible, which a turbine is not, vessels equipped with that type of engines having a separate turbine for backing. In short, a rotary engine should be the ideal steam engine.

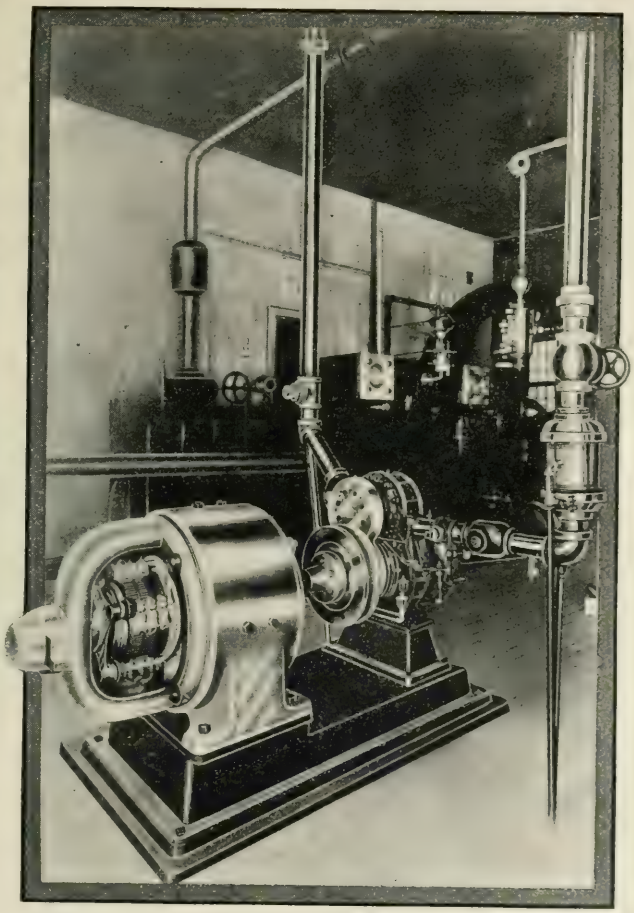
So far as can be ascertained no other notable invention in history was ever made the guest of honor at a society function as a means of announcing it to a waiting world. The social part of the Herrick engine's debut was the real thing, too. Among the guests were John D. Rockefeller and Admiral Cone, of the United States navy, not to mention a number of gentlemen whose names are of some weight in the mechanical engineering world. No doubt the Herrick balanced rotary engine deserved something out of the ordinary, for men have been tinkering at the principle upon which it is based for two thousand years, which is a long time. The first steam engine mentioned in history was made by Hero, of Alexandria, about one hundred years before the birth of Christ. It did no useful work but it suggested what seemed to be the ideal principle upon which to build a steam engine. Hundreds of inventors have tried since to build a rotary engine. Some one has estimated that a hundred million dollars have been spent in these fruitless attempts. George Westinghouse, according to street gossip, spent eight hundred thousand dollars on the same vain quest. Now a hundred million dollars is a good deal of money, and it may be well not to accept these figures too literally, but there can be no doubt at all that the dream of the rotary engine has fascinated several generations of inventors. Thousands of patents have been issued for it and hundreds of models have been made and tested. When enlarged to practical size, however, these models have refused to run at all or else they have been commercial failures.

GERARDUS POST HERRICK.

When he walked out of Princeton University with a diploma stowed in his suit case he was fully resolved to do something that would make folks sit up and take notice—and he did it.

When Gerardus Post Herrick walked out of Princeton University with a diploma stowed in his suit case he was fully resolved to do something that would make folks sit up and take notice. He was not the first college graduate who cherished a more or less open design to set the world on fire, but he was one of the comparatively small

number who laid the kindling for the conflagration in a methodical way, and of a still smaller number who were able to light the fire with hundred dollar bills. Among his assets he included an elder brother, the head of a Wall street banking house, who entertained rather a higher opinion of him than elder brothers usually have of juvenile members of the family. When G. P. Herrick announced that he was going to do something, E. H. Herrick gravely applauded the purpose and volunteered to finance it. The elder brother did not even flinch when, after some months of deliberation, the younger announced that the something was to be the invention of a rotary engine. Others, however, smiled indulgently and cracked jokes as ancient as the idea on which young Herrick set to work.

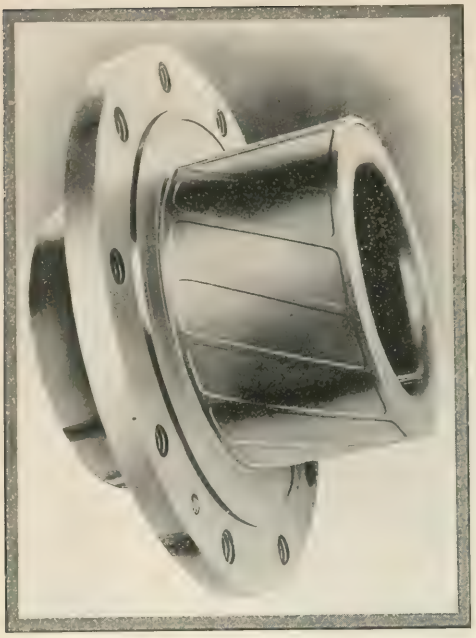


HERRICK BALANCED ROTARY ENGINE COUPLED TO GENERATOR. Photographed during the endurance run at the Degnon Contracting Company's plant, New York City.

A training for the bar is not usually regarded as qualifying the possessor for a successful career in steam engineering; yet it seems to have been the very thing needed in this instance. Lawyer-like, young Herrick prepared his case by reading up all the reports on former failures and in trailing down precedents. Before he knew a soft hammer from a monkey wrench he could shut his eyes and recite the whole list of inventors who had tried to build a rotary engine, tell just how far they got, and why they failed. If there was anything about steam engines he did not read it must have been something that never was published.

Having charted his course and nailed red flags on all the danger points he could locate Herrick's next step was to rent an office in the financial district and a shop in Brooklyn. In the former he installed a couple of draughtsmen and in the latter three star machinists. Then he began to tinker.

The very first thing he discovered was that his vast negative knowledge of the things that could not be done was not helpful constructively. There were so many wrong ways of doing what he wanted done that even the hundreds who had gone before had by no means exhausted them. But while his brother's bank roll held out to burn Herrick could putter serenely on, plotting one idea after another on paper to be executed in cold steel by the machinists and tossed on to the scrap pile as soon as its futility had been demonstrated. After years of



The Balancing Plug.

this sort of thing something was knocked together that seemed promising.

It was sent over to the Stevens Institute in Hoboken to be tested. It was connected to a steam pipe, indicators and dynamometers and things were gotten ready and then the throttle was opened. The thing squeaked, grumbled and groaned, made a few labored revolutions and then, after three minutes of agonizing struggles, stopped short, like the wonderful one-hoss shay, never to go again.

Hopeless? Why, it was so hopeless that it was distressing or funny, according to the temperament of the observer. Prof. Frederick L. Pryor, who holds the chair of experimental engineering at the Institute, took the inventor aside and in the kindliest way possible tried to make him understand that he was doing something very, very foolish; and advised him that if he was determined to waste his time he would do better to play mumblety-peg or something that would not bring on premature baldness.

Herrick took the failure back to Brooklyn, piled it on the scrap heap and started the draughtsmen and machinists on a new tack. A couple of years later he played a return engagement at Stevens Institute with the same result. Six rotary engines were completed one after the other, all of which were unanimous in their refusal to rotate.

But when number seven was finished, after nine years of steady plodding, and connected with a boiler it came to life and continued to run as long as it was given steam. It did the same thing the next day and the next. Adjustments and alterations were made and after each it ran better.

Once more a truck was called and an engine was sent from Brooklyn to Hoboken. Professor Pryor, whose good-humored patience is inexhaustible, told the inventor to go right down to the laboratory and help himself. When the professor happened in some hours later his eyes nearly popped out of his head.

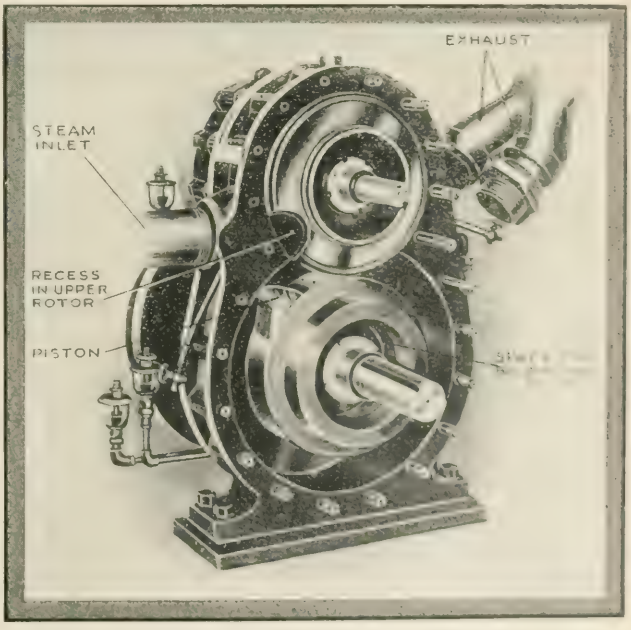
A contraption in steel, not much bigger than a coffee mill, coupled to a steam pipe, was whirring at terrific speed, making very little noise about it, as if it could keep going forever. It was only 25 inches high, 17 inches wide and 21 inches long and weighed 835 pounds; yet when the dynamometer brake was applied it was found to be developing a little more than twenty horse power. The counter showed that it was making 1,006 revolutions per minute. This engine was put through all the tests that are usually applied to steam engines, in all of which it made a creditable showing, throughout the month of July, 1909. Then it was taken over to the plant of the Degnon Contracting Company in New York and attached to an electric generator to furnish lights on the job. It was treated exactly as any other engine would be treated under similar circumstances and was run by the regular engineers from August 14 to December 21, 1909. It was run for 1,685 hours, or the equivalent of more than six full working months. On 66 days it ran 17 hours a day, and on 18 days delivered power for 24 hours a day. It made one run of 149 consecutive hours at an average speed of 955 revolutions per minute, delivering power at 220 volts and from 10 to 22 amperes according to the number of lights required at different hours. Throughout the whole service test there were only two compulsory

stops due to the engine itself. One was due to a wrongly threaded nut, the other to a leaky packing. In steam consumption both at the laboratory and in the service test the showing was very favorable.

The Herrick balanced rotary engine consists of but nine parts, aside from bolts and nuts. Compared with the ordinary reciprocating engine with its hundreds of parts it is a marvel of simplicity. The original engine consists of two rotors, or cylinders placed on top of one another in a casing. The upper cylinder controls the admission of steam and acts as an abutment for the lower or working cylinder, which has a piston in the shape of a square paddle. The upper cylinder has recesses which serve as a steam inlet and also allows the piston of the lower cylinder to pass. The synchronous movement of the rotors is maintained by timing gear outside the chambers. Plugs containing the balancing chambers and a check are inserted between the rotor and the main bearing. The only points of moving contact in the engine are at the bearings, the rolling contact, and the checks in the balancing plugs. The piston being attached to the shaft, power is developed directly along the shaft as in the turbine. Steam admitted to the cylinder through the recess in the upper rotor expands through about two-thirds of the revolution before reaching the exhaust port, causing the piston to revolve in a continuous circular path and also by exerting a counterbalancing pressure in the balancing chambers, overcomes, throughout the stroke, the radial loads that the cylinder pressure would otherwise exert on the main bearings. Herein is the secret of success.

The hitherto insurmountable obstacle to a rotary engine lay in the fact that steam introduced into a cylindrical chamber with a radial piston, while it pushed on the piston all right, also exerted so great a radial frictional pressure upon the main bearings that it used up all the power and in many cases totally destroyed the engine. Herrick balances his rotating drum by introducing through small ports in the drum steam into a series of stationary balancing chambers which forms a film one-thirty-second of an inch thick. This does not seem much but it is enough to overcome the friction so that the cylinder floats, light as a feather, on a cushion of steam. The balancing chambers are automatically connected in succession with the steam supply as the piston revolves. As the steam in the cylinder is reduced in pressure by expansion the pressure in the balancing chambers is correspondingly reduced. From maximum cylinder pressure to exhaust, therefore, the pressure in the balancing chambers away from the bearings is always substantially equal to the pressure from the cylinder toward the bearings, thus maintaining practically a perfect balance.

In the laboratory tests at Stevens Institute, Professor Pryor found that with steam at 145 pounds pressure the engine, making 1,006 revolutions per minute and developing 20.48 horse power, consumed 50.7 pounds of water per brake



ROTARY ENGINE WITH SIDE PLATE REMOVED

horse power per hour, which is regarded as an unusual showing for so small an engine.

After the first engine had passed through its service test triumphantly an engine of 100 horse power was built and is now undergoing a laboratory test. The larger engine shows improvement in design, having two working cylinders instead of one with a rotary valve above for the admission of steam. The inventor does not claim that the rotary engine is perfect in its present form any more than Watt's first engine or the first practical turbine was perfect, but only that he has discovered the correct principle upon which to build rotary engines and has made a commercially practicable application of this principle. The steam economy already attained promises brilliant results for the future.

An advantage that can be claimed for the rotary engine is a great reduction in first cost, to begin with. The 100 horse-power engine weighs but 4,000 pounds as compared with 12,000 pounds for a reciprocating engine of the same power. Its castings are extremely plain involving no delicate core work. It has no complicated forgings, such as valve gear, links and the like, and the bulk of the material is cast iron, which is cheap. It takes up very little room, only 64 cubic feet for 100 horse power; it is free from vibration, which eliminates the expense of elaborate foundations. The only moving contacts are the bearings, at the rolling contact of the rotors and the checks in the balancing chambers; so the cost of upkeep will be very low. It can be operated economically at all speeds and is readily reversible, can use superheated steam at high pressure, which makes it ideal for combination with the turbine. The use of high pressure rotary engines exhausting into low pressure turbines will undoubtedly result in a high efficiency.

CALIFORNIA'S NEW GUSHER ERA

By

C. L. EDHOLM

WITH the gusher era, California has added to the world's wealth in her usual generous and spectacular manner, reminding one somewhat of the western millionaires of the "Scotty" type, who fling their golden largess right and left, to be scrambled for, not taking any particular pains to dodge the kodak of the newspaper man while making their splurge.

The official estimate of the riches flung skyward by the oil wells of the state during 1909, has just been given to the public. It represents the tidy sum of thirty-two million dollars, according to the report of the State Mineralogist Aubrey. This is the estimate of the value of the year's output which amounts to more than fifty-eight million barrels.

No wonder capitalists from the east and abroad are pricking up their ears at the sound of the roaring geysers of black, ill-smelling fluid, which, nevertheless, has such a golden shimmer to it when seen at the proper angle. No wonder that California is going "oil crazy," just as in other times it succumbed to the gold fever and the *corner-lotitis* of the days of the real estate boom.

According to the United States Geological Survey, the amount of oil remaining in the ground to be brought to the surface for the benefit of the lucky investors, will come to about ten billion barrels. So that the year's output, great as it is, may be reasonably compared to the handful of gold that "Scotty" throws to the bell-hops.

Strange as it may seem, the fact that

A SCENE IN THE STREETS OF LOS ANGELES.
The derricks have encroached upon residential property.

there is an inexhaustible supply of oil will tend to raise the prices in the long run rather than to lower them and the explanation of this seeming paradox is that oil burners will be installed in constantly increasing numbers with the assurance that there will be no oil famine to render them useless. Therefore the owners of generous wells like the Lakeview gusher watch its flow of about 40,000 barrels a day without any despondent forebodings of a glutted market.

The Lakeview is the most famous of the gushers which has brought sudden wealth to its owners. Imagine a column of black oil spouting from two hundred to four hundred feet high, throwing a spray for miles about and forming a veritable lake of crude petroleum in the reservoirs. That sounds like a spasmodic attempt to make a showing when company is expected, but when you think of a flow like that keeping up, with practically no interruption, from the middle of March to the present writing, it appears to be a very lengthy spasm.

The history of this well is picturesque and typical of the ups and downs of the oil industry, which reminds pioneers of the days of the gold seekers with their long chances and big stakes. It seems that in the boring the company met with the sort of bad luck that frightens away the "quitter" and makes the true prospector spit on his hands, set his jaw and go at it again. They got a crooked hole in No. 1, and, after straightening this, a string of tools was lost and three months were required to fish them out. Before they had recovered from this discouragement the derrick pulled in while loosening up some casing, the strain causing it to collapse in a heap of kindling wood. After this jolt the company came up smiling, rebuilt the derrick and was prepared to resume drilling operations.

In spite of the good front they were putting up, however, they were near the end of their financial resources, having spent about $70,000, so when the Union Oil Company offered to carry the work to completion for fifty-four per cent of the stock, the offer was accepted. The description of the big strike in the words of one of the well owners is graphic and picturesque:

"About midnight, March 15th, the oil sand was centered in well No. 1, which started to gush, but choked up in a few minutes, following which nothing was done until seven o'clock Tuesday morn-

ing, when the bailer was dropped down the hole to loosen the sand. Suddenly during the progress of the churning, the bridge was broken up, and the bailer shot out of the hole with terrific force, lodging half way through the crown block at the top of the derrick. Until eight o'clock Tuesday evening, when it again sanded up, 24-gravity oil shot out of the hole at the rate of 30,000 barrels a day. After being quiet for one and one-half hours, it again broke loose with greater force than ever, shooting stones the size of doubled fists with sand and oil up through the six and five-eighths-inch casing. These literally wore out and chewed up and tore loose the crown block and cap timbers, releasing the bailer. It then spouted rapidly, but geyser-like through this opening about 200 feet high. The spectacle on Wednesday morning was plainly visible to passengers on the train twenty-three miles east of Maricopa. During a windstorm Wednesday afternoon, the spray ruined all wearing apparel exposed at Maricopa, two miles away."

SILVER TIP GUSHER, COALINGO.
The oil flows from this well at the rate of some 25,000 barrels a day.

The following day the flow was measured both by the standard and independent gaugers and during the hours between 11 a. m. and 3 p. m., 32,000 barrels were pumped through one six-inch and one four-inch pump, into its tanks, the oil being caught in a series of reservoirs, the last of which has a capacity rated at something over a million barrels.

From day to day the newspapers have reported the progress of the flow of the Lakeview, which for a time threw less spectacular producers in the shade. The Company experienced great difficulty in capping the well, and its work was in vain for early in May the gusher suddenly broke loose again, tearing away the capping and shooting skyward four hundred feet. The temporary repression had simply doubled its force, for 90,000 barrels flowed from it during that night and part of the day.

What it means to have a producer like that on your hands, working steadily for you twenty-four hours a day may be grasped by the dimensions of the storage sump constructed by the company in a near-by canyon. It will have a depth of sixty feet, and a width at the top of seven hundred feet, and a length of a quarter of a mile.

On June 22, just one hundred days after it was brought in, the estimate was made that four million barrels of oil had been produced, worth about two and a half million dollars. The flow was not diminished at the end of this period and showed no sign of subsiding. The casing of the well has disappeared and the hole is many feet wide at the top.

Tales told by the drillers would seem to indicate that it is quite as interesting

to work about one of these wells as it would be to fool around the muzzle of a twelve-inch gun during target practice. You can't ever tell just when a string of tools is going to be shot out of the hole, reducing the derrick to junk and causing the workmen to break all sprinting records. Then such things as an oil tank conflagration or fighting the fire of a burning gas well with steam, tend to make the oil man's occupation anything but monotonous.

This little story of the Standard three hundred feet, a dark brown column, with a force of fully fifteen hundred pounds to the square inch. This can only be estimated, as a thousand-pound gauge was not equal to registering the pressure. The noise of the expanding gas was so great that the workmen might as well have been deaf mutes, as they could communicate with each other only by signs. Pieces of the rotary drill have been thrown from the hole, bent, twisted, and polished by the action of the sand and gas."

A BETTER REFLECTOR THAN ANY LAKE.

"gasser" on Section 26 in Midway condenses a lot of hard work and heroism into a few lines.

"The gas belt was entered at 2,370 feet in this hole on the night of May 20, at nine o'clock. The strike was signalized by a terrific explosion followed by a column of flame, the gas igniting from the derrick lights. It required several days of hard work to extinguish the flame, making necessary the installation of six big boilers. With these fired up, sufficient steam was generated to snuff out the blaze. The well was then capped, but tore away the gauge as soon as the vent was closed.

"Then with a deafening roar it began to shoot gas and sand to the height of

The wells which conduct themselves thus violently are not the only ones that "deliver the goods," although they are the ones that get the most publicity. There are steady-going old plugs, thousands of them, that turn out the regular number of barrels every day, which help bring up the total to fifty-two million barrels.

Nor is the oil business in California a game against which there are great odds as commonly supposed. An interesting table has been made public by the United States Geological Survey, which indicates that beginning with the year 1905 to 1908, inclusive, the percentage of the successful wells has been 95.9 to 96.8 per cent. Previous to that the percentage of

OIL WELLS AMONG THE SANDS.

failure was much greater, but scientific methods have made the oil business as safe as any other.

The table which includes twenty years from 1888 gives a total of 5,611 wells drilled, of which 81.9 per cent. were successful.

Enormous fortunes have been made in this industry. It is stated on good authority that within the last ten years oil stocks listed on the California Oil Exchange have paid dividends amounting to about twenty-five million dollars, and as many of the dividend paying companies have not listed their stocks the total returns would be far in excess of that sum.

As an instance of the money-making opportunities of the industry is the rise of the Union Oil Company of California. It started out with a few pieces of oil property in Ventura County, and ten years ago a controlling interest of the Company changed hands for $300,000. That Company is today worth one hundred million dollars, and other California oil companies show similar stupendous growth. It is pleasant to know that much of the profits of the gusher era have gone to enrich those who did the pioneer work.

The oil business, which was destined to become the greatest industry of California, amounted to very little until the "boom" in the early 90's when valuable deposits were discovered in the city of Los Angeles by Mr. E. L. Doheney, who is now one of the most prominent and active oil magnates of California.

Between the fall of 1892 and the end of 1895, Mr. Doheney drilled eighty-two wells, and by that time scores and hundreds of others had followed his lead until almost two thousand wells had been sunk in the city of Los Angeles alone. Most of these are still operating extensively throughout the city and impartially invading both industrial and residential neighborhoods, overshadowing the humble homes near the Southern Pacific yards, fringing the old cemetery on Buena Vista Street, and casting their shadow upon luxurious mansions in the West Lake district, a fashionable and exclusive section of the city.

The great fortunes in California oil are not all in the past, by any means; the increased production is leading to an even greater demand and new wells and even new areas are being discovered. Moreover the present selling price of oil can not be taken as a fixed standard for computing the profits.

With the constantly increasing market

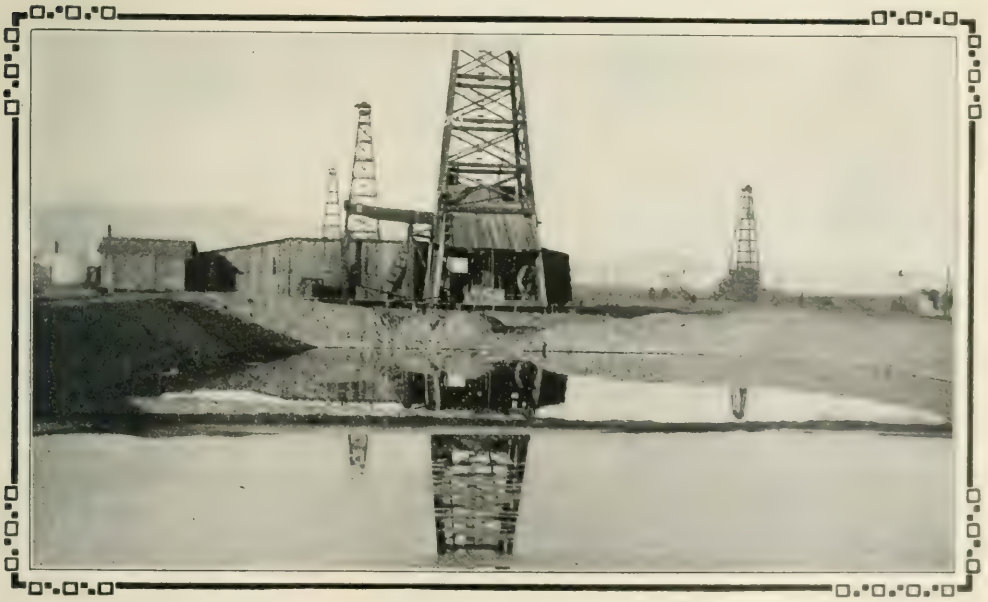
for California oil as a fuel in the navies of the world, in the railroads and industrial plants, the price, which is now about 60 cents a barrel, is bound to advance and in consequence greater production may be expected. In addition to the use of oil for fuel and refining, the oiled roads of California are demonstrating the advantages of crude petroleum over macadam, as the dustless, waterproof surface makes a perfect highway which, when placed upon a well built roadbed is practically indestructible. It has the great advantage of resisting the upward suction of automobile tires, which is so destructive to macadamized roads.

A Train of Oil Cars.

The United States navy has been experimenting with fuel oil on the Monitor Cheyenne, and the results have been so satisfactory that six oil storage tanks have been ordered at points along the coast from Narragansett Bay to Colon, and it is believed that when the oil producers can show a sufficient steady output, the Government will adopt the liquid fuel to propel our war vessels.

In addition to the comparative cheapness of oil over coal, it is claimed that the oil-fired vessel can be made from five to eight per cent. more efficient than the coal burner. The ease of operation would reduce the force required to feed the furnaces besides making it unnecessary to have any of the furnaces out of commission for the purpose of cleaning out the clinkers, ashes, etc.

There is a vast saving of storage space, and, most important of all, there is a great saving of time in taking on fuel. In the British navy a battleship has been known to take an oiler in tow, filling the tanks while making eleven knots. This feat took place far from shore and in rough water, and only required four hours for completion. To coal a ship of



A RICH FIELD OF OIL.

that size would require about sixty hours besides the time taken to go to and from a coaling station.

These are a few of the reasons why oil producers are hopeful of seeing their products used in the United States navy as it is, at present, in the British.

The use of oil burners on the railroads will lead to a greater demand for California's leading product year after year. The work done by some of the "jumbos," or monster engines weighing more than one hundred tons each, would be impossible for coal-fired locomotives. The Western Pacific is said to be using three thousand barrels a day, the Great Northern requires five thousand barrels a day, and the Salt Lake is another non-producing road in the market for oil.

The Santa Fé and the Southern Pacific are producers, but it remains to be seen whether they can develop their own oil holdings sufficiently to supply their needs.

There is a lively competition for claims of oil lands and as it is necessary to show that valuable mineral deposits have been reached in order to perfect a claim, drilling on the public lands is something in the nature of a gamble, as two rival drillers can work on the same land and the first to strike oil takes it.

Pump That Drives Oil Through the Pipe Lines.

Another interesting feature of the drilling for oil is the boring of wells as near as possible to the edge of a claim. This is done by certain companies in order to drain off the oil from the neighboring claims and protect their own, as the oil sands are loose and porous and the deposit can percolate for some distance.

This fact is the nub of the opposition to the "Pickett Bill" now before Congress. It differs from the conservation measures which withdraw coal and other mineral deposits, inasmuch as the withdrawal of public oil lands would not conserve the oil.

A Washington dispatch presents the argument of Thomas O'Donnell, representing the producers, before the Senate Committee which is considering the bill. The point was made that on the rich oil fields of the San Joaquin Valley each alternate section is owned by the Southern Pacific Railroad. The claim of the California oil

Lakeview Gusher, Maricopa County, California.

men is that if Congress were to withdraw the United States lands from the oil fields the railroads could drill on the lines of its alternate sections and drain this vast deposit of liquid wealth into its own tanks.

While as a general policy conservation of timber and mineral wealth is for the welfare of the public, the facts are quite the reverse in the case of oil when a great corporation has patented land in the immediate vicinity.

WILD GAME TO CUT MEAT BILLS

By John L. Cowan

IF something is not done, and that speedily, to bring the cost of living to a more equitable relation to the earning capacity of the average man, it will not be for lack of suggestions looking to that end. Efforts, backed by experts of the Department of Agriculture, are being made to secure an appropriation from Congress for the introduction of the unwieldy hippopotamus to the marshes and sluggish streams of the South. Secretary James Wilson, of the Department of Agriculture, earnestly advocates that the millions of muskrats, annually slaughtered for their pelts, be utilized for food; and publications of the division of biological survey for several years have been urging upon the attention of farmers and live stock producers the general subject of game farming, with particular attention to deer and elk farming.

If it be really necessary to search for a supplementary meat supply, it is not at all likely that relief will be found in the introduction of foreign species such as the hippopotamus. The world never knew a more useful or more prolific game animal than the American bison. It fed the Indians of the major part of North America for unknown ages; supplied the fur traders and trappers of the West with fresh meat throughout the half century during which they pioneered the way for civilization; was the principal food reliance of the soldiers at Western military posts through the whole period of the Indian wars; made possible the maintenance of the vast army of laborers that constructed the first transcontinental railroads; and made the problem of living comparatively simple for plainsmen, freighters and emigrants throughout the period from 1840 to

ELK ON THE PLAINS OF WYOMING.

1869 when Western transportation was confined to wagon caravans, when Western agriculture was unknown, and when the Western live stock industry was undreamed of. So long as the buffalo were found in countless numbers on the plains, to keep the Indians upon reservations was impracticable; they were independent of "beef issues," and not at all averse to a fight. The extermination of the buffalo, therefore, is sometimes justified on the grounds that it was a military necessity.

Breeders of Angora goats argue in favor of the indefinite extension of their industry that there are at least 250,000,000 acres of mountainous or desert land, entirely valueless for agriculture or for grazing sheep and cattle, that might be made in some degree productive if devoted to the rearing of goats. Advocates of game farming claim that this land is as well adapted to the rearing of buffalo, deer and elk as of goats; and that the larger animals are perfectly able to defend themselves and their young against the attacks of wolves and coyotes. Goat meat will never be popular as an article of diet, but venison and elk meat will never be sufficiently abundant to overstock the market.

In the interminable discussion that has been going on as to the reason for the high prices of meat products, but little has been said concerning the passing of the "open range." Yet this is doubtless the most important factor of all, in the inauguration of the era of high prices for fresh meats. It is generally conceded that, notwithstanding a great increase in the population, the number of sheep and of beef cattle in the country is materially smaller now than a decade ago; but there is a tendency to regard this fact as anomalous and unaccountable, instead of directly due to the virtual disappearance of the "open range." Inevitably, with the "open range," the rearing of vast numbers of "range cattle" and sheep, almost as wild as deer, elk and mountain sheep, has passed into history. Of course there are still range cattle sent to market, but they have long since ceased to be the dominating factor in the live stock markets of the West, and every year their relative importance becomes smaller. They are, in fact, almost a negligible quantity. The homesteaders have invaded the "cow country" in a conquering army of hundreds of thousands, and "the open range" of a few years ago has been cut up into "dry farms," and crisscrossed with wire fences; and where the round-ups used to

be held there are now great irrigation reservoirs or populous towns.

The obvious objection, of course, to elk and deer farming as supplementary to ordinary live stock raising is the existence of game laws in almost every state forbidding the killing of elk or deer excepting for a short open season in the fall; and of laws in many states forbidding the sale of venison or the shipment of carcasses outside the state boundaries. These laws, of course, were passed before deer farming or elk farming were seriously thought of. However, they apply to deer and elk reared on farms and private game preserves just as emphatically as to the wild game of the mountains. Before game farming can become attractive to individuals who might engage therein, or important to the people as a source of meat supply, these laws must be amended so that the man who rears deer, elk or other animals, classed as "game," for market, will be permitted to slaughter his live stock whenever he chooses, and to sell the meat wherever he sees fit. To such an amendment to the laws, there can be urged no rational objection. A similar amendment is needed to the game laws to permit pheasant farmers to kill and sell pheasants reared in captivity at any time and in any market. It has been conclusively demonstrated that pheasant farming is vastly more profitable than the rearing of ordinary farm poultry; and the only hindrance to the indefinite extension of the industry lies in antiquated game laws that fail to provide for the contingency of birds classed as game birds being reared in a state of domestication.

Probably it would not be advisable to attempt the rearing of deer, elk and other large game animals on a large scale in a state of entire domestication. That is unnecessary, although not impracticable. It is pointed out by publications of the Biological Survey that the elk, particularly when large numbers of them are together, are perfectly able to protect themselves and their young against the attacks of wolves and coyotes. How important this consideration is may be inferred from the fact that in some sections of the West the depredations of wolves and coyotes upon lambs and calves have

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THE WATERING PLACE.

deprived stockmen of the legitimate profits of the industry, in spite of every effort that could be put forth to destroy the four-footed bandits by poisoning, trapping and hunting them. The elk farmer will have no need to fear the depredations of these pests of the sheep and cattle ranges, as his live stock will be abundantly able to take care of themselves.

The largest herd of elk remaining in North America are in the Yellowstone Park and Jackson's Hole region of Wyoming, estimated to number at least 30,000. There are some large bands still to be found in the wild and unsettled parts of Colorado, Wyoming, Montana, Idaho, British Columbia, and Labrador, with smaller herds in the densely wooded sections of Washington, Oregon, California and the Dakotas. But they are now so rare in most regions that it is difficult to realize that their numbers were once comparable with the numbers of the buffalo on the plains. In climate and altitude, the elk was the most adaptable of American big game animals, being found throughout the United States and temperate portions of Canada. They were so numerous in some sections that men on horseback rode among them and shot them right and left as fast as they could discharge their firearms.

The Top of the Sheep Herder Trapped.

The heavy snows of the past two winters were responsible for curious conditions in many sections of Colorado, Wyoming and other Western States. Unable to obtain forage on account of the almost unprecedented snows, the elk descended to farming sections and raided the farmers' haystacks. The farmers might drive them away, but that did little good, as the starving animals promptly returned as soon as the pursuit was discontinued; and to shoot or injure them meant trouble with the game wardens. Travelers on transcontinental journeys frequently caught sight of long lines of elk making their way leisurely towards the nearest haystack, or retreating towards the mountains as the snows began to melt. In January and February of 1909, great numbers of elk in the vicinity of Jackson's Hole, Wyoming, were found to be in grave danger of starving to death, and the citizens of the town raised $700 for the purchase of hay to feed to them. Then the State Legislature took cognizance of the situation, and appropriated $5,000 to save the elk. Apparently coming to understand that human beings were kind-hearted and liberal, after all, the elk made themselves perfectly at home, and might be seen strolling through the streets of Jackson's Hole at all hours of the day and night. As many as 500 elk were counted within the town limits at one time; and ranchmen of the neighborhood had to guard their haystacks and strawstacks day and night in order to save enough for their horses and cattle. Last winter the elk had to be fed again, and now the bands of the Jackson's Hole and Yellowstone Park region may properly be considered as partially domesticated.

This shows how peculiarly elk are suited for rearing in a state of semi-domestication in mountainous regions unsuited for farming or for raising sheep and cattle. On large ranges, great bands could forage for themselves, excepting in the severest of winter weather, when it would be necessary to supply them

with hay, and, perhaps profitable to provide them with shelter. They are more hardy than range cattle, and with limited winter feeding the mortality due to the elements would be trifling, or nothing at all, instead of reaching the ruinous proportions it often does on the cattle ranges. In the fall the elk live on grass, leaves and twigs, eating with relish even the dry leaves that have fallen from the trees. During the winter months they paw several feet of snow from the ground to gain access to the leaves and grass beneath; but if the snow becomes compact and heavily crusted with ice large numbers sometimes starve. It is estimated that but for the aid of the citizens of Jackson's Hole and the State of Wyoming, not fewer than 20,000 elk would have perished in January, February and March of last year. Even in ordinary winters it is probable that there is great mortality among the wild herds on account of the difficulty they experience in pawing through the snow to obtain sufficient food. This is doubtless the principal factor in limiting the increase of the herds, as their natural increase is at least equal to that of cattle.

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VENISON ON THE HOOF.

Elk farming, then, on a large scale, with adequate winter feeding, ought to prove fully as profitable as range cattle raising ever did. The great losses that the cattlemen sustained on account of the depredations of wolves and coyotes upon young calves, and on account of the severity of the weather would be entirely eliminated; and under any conditions the cost of winter feeding would be trivial in comparison with the value of the live stock.

Elk have been reared on private game preserves located all the way from Vermont to Washington and Oregon for many years; but it has never been reduced to a strictly commercial proposition. It is said that the largest elk herd in captivity is that of Barrett Littlefield, near Slater, Colorado. Every season Mr. Littlefield ships many carcasses to the Denver market, besides supplying the live animals to many zoological gardens. Mr. Littlefield states that elk farming is much more profitable than cattle raising, in spite of the handicap of unfavorable game laws. J. B. Dawson has several hundred head of elk on his ranch near Hayden, Colorado; and the Glen Beulah

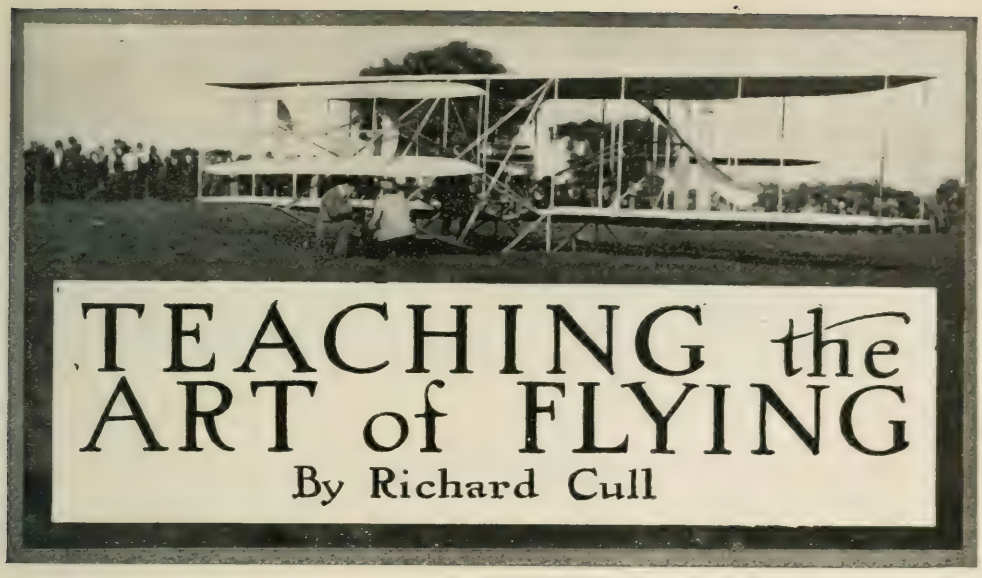
BUFFALO ON THE FLATHEAD INDIAN RESERVATION.

deer preserve, near Debeque, Colorado, is noted for its fine herd of elk and deer. George W. Russ, of Eureka Springs, Arkansas, has had a herd of elk on his estate for many years; and both deer and elk are reared on the Austin Corbin game preserve in New Hampshire; the estates of Dr. W. Seward Webb, Vermont; Wm. C. Whitney, Massachusetts (Tuxedo Park); the Lorillard estate, New Jersey; the game preserve of the Blooming Grove Park Association, Pennsylvania; the Vanderbilt estate, North Carolina; the game preserve of the Sapelo Club, Jekyll Island, Georgia; that of the Caton International Forest Association, Illinois; the Goodnight Ranch, of Texas; the estate of Col. Frank Alliny, Washington, and numerous others. The practicability of elk farming then, is not open to question.

THE BEAVER AT HOME.

Practically the same conditions would control deer farming, although deer are not as hardy as the elk, or wapiti. Dr. C. Hart Merriam, Chief of the United States Biological Survey, in a bulletin of the Department of Agriculture issued in June, 1908, said that "deer farming may be made profitable alike to the State and to the individual engaged therein."

That the buffalo, under favorable conditions, can be reared at a profit has been abundantly demonstrated on many private game preserves and in many parks. It has been estimated that the buffalo on the plains once numbered more than 4,000,000 head, and that at one time these were so nearly exterminated that not more than one hundred specimens remained alive. At the present time there are more than 700 head on the Wainwright Park reservation of Canada, transferred thither from the Flathead Indian reservation of Montana. Their rate of increase is about the same as that of beef or dairy cattle; and Mr. Kendrick, whose experience with elk and antelope has already been quoted, states that a buffalo can be reared for a price per head no greater than the cost of raising a cow. The hide alone is worth more than the cost of raising the animal and all other income from it is clear profit.



TEACHING the ART of FLYING

By Richard Cull

IF you would learn to fly, first master the art of propelling a bicycle. The would-be aviator must be possessed of a keen sense of equilibrium; he must know how to balance himself as he would were he riding a bicycle or some other vehicle whose successful operation was dependent on the perfect poise of the rider.

At the Wright School of Aviation at Dayton, Ohio, established and maintained by the famous brothers, this principle is one of the fundamental precepts to be taught. The dean of the School of Aviation in matriculating a student, makes this his first question: "Have you ever learned to ride a bicycle?" Let the aviator budge from the space prescribed for his personal comfort while soaring aloft and the smooth operation of the craft is at once retarded. If he moves a few inches from his seat in any direction, the chance of an accident occurring is increased tenfold. The ship may turn a somersault and tumble to earth. The student is therefore cautioned to stick to his seat at all hazards. By doing this his teacher tells him he may be reasonably sure of safety, for, should the motor stop or any part of the aeroplane's mechanism fail to perform its function, the craft will safely glide to earth.

PHOTO BY PAUL THOMPSON.

READY FOR FLIGHT.
Lady learning to fly at Brooklands.

Another requisite that looms large is courage. If any mishap befalls the aeroplane while he is spinning through the air, unless the operator have an abundance of nerve, he is more than likely to destroy the poise of the car and cause a swift descent.

An intimate knowledge of mechanics is not a requirement occupying space in the course for the student of flying, according to the methods in vogue at the Wright School. A pupil may learn in a few days enough of the mechanism of a machine to operate an aeroplane with success if he but be possessed of the other requisites supplied by nature and varied training. A majority of the pupils, however, before matriculation, have made a theoretical study of the science of flying.

The physical assets of the pioneer school of aviation lack all of the archi-

tectural adornment of other institutions of learning. There are no study halls, recitation rooms, gymnasiums, science halls, libraries or other departments of a modern school of learning. Aside from the professors, the pupils and the machines, the study hall is all there is to this school. The student hall is nothing but a broad field, barren of everything but vegetation, to which other broad fields may be added from time to time, for the navigation of the airships.

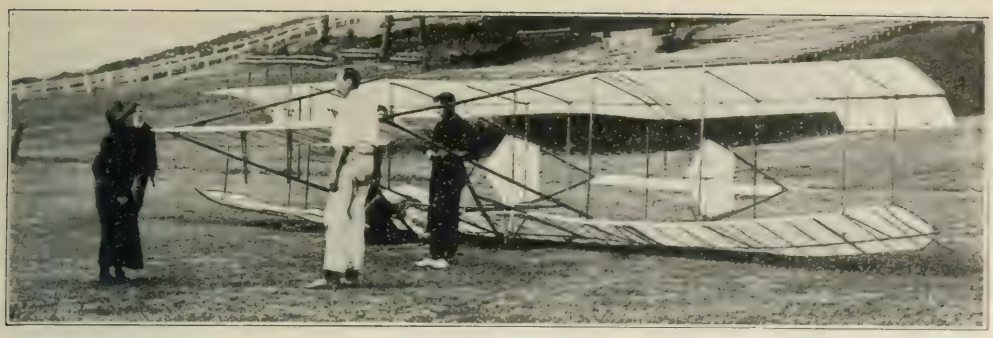
A Wright Pupil Leaving Starting Rail for His First Flight.

Orville Wright and a Pupil Gliding to Earth with Motor "Dead."

Unwheeling an Aeroplane Out of Its Shed at the Wright School of Aviation. Glimpse of daily throng of spectators at the school in the background.

SCENES AT THE WRIGHT SCHOOL OF AVIATION.

At aviation schools there need be no athletic grounds whereon the students may disport themselves after hours of close application to study. The study itself is sufficiently exhilarating and thrilling to dispense with the necessity



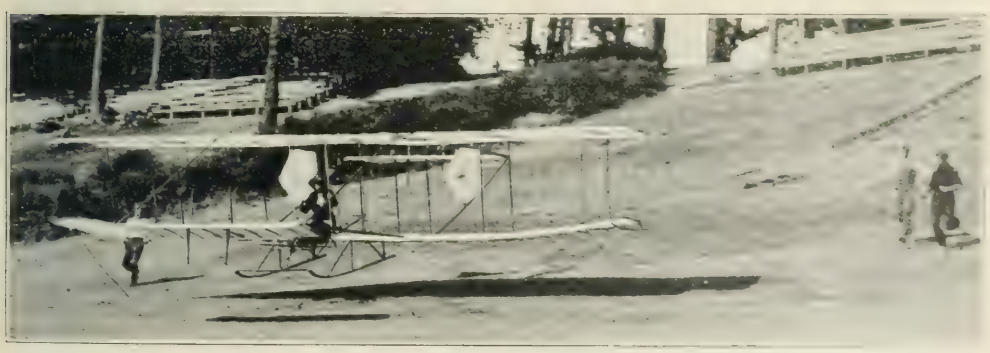
PLEASE GET MY GLIDER READY!
Several ladies are learning to fly at the Brooklands School of Aviation.

of furnishing exercise to the pupil. With the sky as a playground, the pupil frowns upon the pleasures of earth, and plays while he works.

Aviation pupils possess one large advantage over students of other institutions in that after a few weeks, and rarely longer than a few months, of study, they are prepared to earn money for themselves by fulfilling contracts for exhibition flights arranged for by the faculty of their school. An illustration of this make-money-quick ability with which the aviation school graduate is endowed was given at the Indianapolis State Fair recently, when a group of the Wright pupils gave a series of successful flights, executing a contract that netted the Wright Company $50,000. The student's share of the prize money is necessarily large by reason of the danger he braves and in this instance all the pupils received their first pay from funds which they earned by their flights.

Before learning to fly, it is advisable, and almost necessary, to learn how to glide on a glider. A glider at first sight looks like a small biplane without an engine, but really differs in many respects. The tail is replaced by an elevator which works in conjunction with a front plane, and the control is very similar to that of the real machine.

At the aviation school at Brooklands, England, gliding practice takes place from the top of a hill. The glider is placed on the slipway, the pupil is seated, and two assistants keep the planes steady. The pupil is then told to place both feet firmly on the steering rod; all being ready, the assistants pull the glider down the slips, and at a given word leave the machine to continue its course to the end of the slipway. At this point the trolley falls, and the glider gradually rises and travels along for about forty yards, until its momentum gives out, and it gradually descends.



IN FLIGHT.
The first lessons are with a glider.

AN AFTERNOON SCENE IN FIFTH AVENUE, CHICAGO.
Searching the early edition of the evening papers for a job.

INSURING AGAINST IDLENESS

By

CECIL BEMBRIDGE

No matter how uniformly successful and prosperous a country may be, rises and falls in its forward movement are as inevitable as the fluctuations of a barometer under climatic variations. Such alternate movements have been inseparable from industrial development ever since the world began, and no matter how studiously things may be scheduled to avoid such movements, it is inevitable that the lean should follow the fat years with unfailing regularity and monotony. In such phases it is the man who toils by the sweat of his brow who suffers. Unemployment cannot be avoided, but it is rather hard that the industrious mechanic, who having the opportunity of earning his livelihood at his usual avocation denied him, through no fault of his own, should suffer. It is probably the most perplexing problem of the present day, and it has engaged the attention of statesmen and economists who have the question of social reform and the welfare of the human race so closely at heart, in all parts of the world, for unemployment is not peculiar to any one country, nationality, or industrial community. It affects all more or less, and in varying degree. Even in this country the problem is not unknown though we are admittedly a young, enterprising, and expanding nation, but when supply overbalances demand, then the former must be reduced and such cannot be accomplished without throwing a certain number of men idle. Why, according to our own labor representatives there were over 2,000,000 men looking

for work the winter before last, and even today the aggregate of unavoidably out of work runs into hundreds of thousands.

In Europe where the question is admittedly more acute than here it has at last been grappled with by the governments. It is realized that the mechanic is the prop and stay of a nation. Without him its industries must languish; its life blood be sapped. Therefore the workman must be protected; he must be tided over those periods when industrial depression compels him to lay down his tools and wait for better times. And the European powers are tackling the problem in an earnest manner. "If we don't look after our children when they are thrown out of work, they will simply go to other countries where work is to be found, leaving us the work-shies, incompetent, and hoboes" trenchantly stated one authority in England a few weeks ago.

The result of agitation in England was the appointment of a royal commission to study the whole subject from every point of view, evolve ways and means of counteracting its admitted evils, investigate the machinery and scope of the trade unions in their efforts to mitigate its influences, and ascertain how various powers on the continent of Europe dealt with the matter. So exhaustive were these investigations that two years were occupied in threshing out the task and the compilation of a full report upon the whole topic.

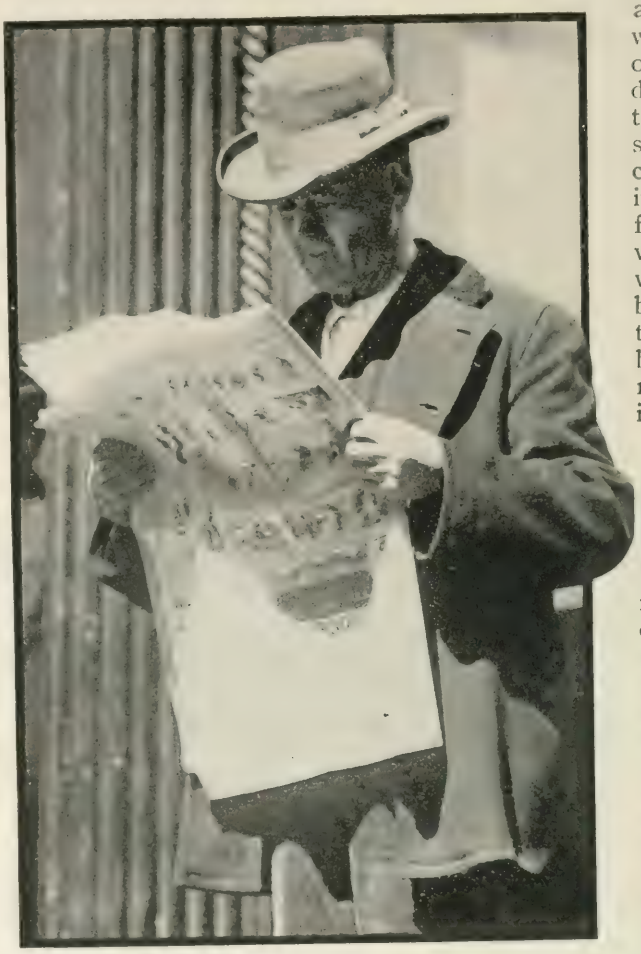
In the course of these investigations some surprise was created at the extent of the work of the trade unions in this field of social reform. It was found that one hundred trade unions in England paid in benefits to their members, who were deprived of employment, no less than $3,250,000 in a single year. This sum expended in relief represented sufficient to pay 36,000 members, practically four per cent of their total roll, $1.75 every week for twelve months. But 36,000 did not represent the actual number of unemployed members who were assisted in this manner. Far from it. At times the total rose to a very

THE UNEMPLOYED BEING FED IN THE BASEMENT OF A CHARITABLE BUSINESS HOUSE.

heavy figure, while at others it was less, because the number of men who were idle the whole year round was very small. The unions have celebrated a very workable and attractive scheme for mutual assistance in this direction. A member falls out of employment. For six months he receives a certain sum weekly, and for another six months a further contribution which is about half of that for the first half year. If a man secures employment in the meantime, he must occupy that post continually for a certain length of time before he can fall back again upon the funds of his association for unemployed relief.

The sum of the commission's labors was that they came to the conclusion that the trade unions who were performing the most useful work in this field of relief, should be relieved thereof, as it was a task that should be carried out by the state, seeing that the workpeople were the children of the state, and responsible for the country's welfare industrially and commercially. In this manner the evils attending unemployment would be lessened, as the expense of defraying the relief would be spread over the whole community, so that but a small tax was imposed upon each citizen, whereas in the trade unions, the members had to bear the cost of such among themselves, and such imposed a supreme tax upon many of those members who were in employment.

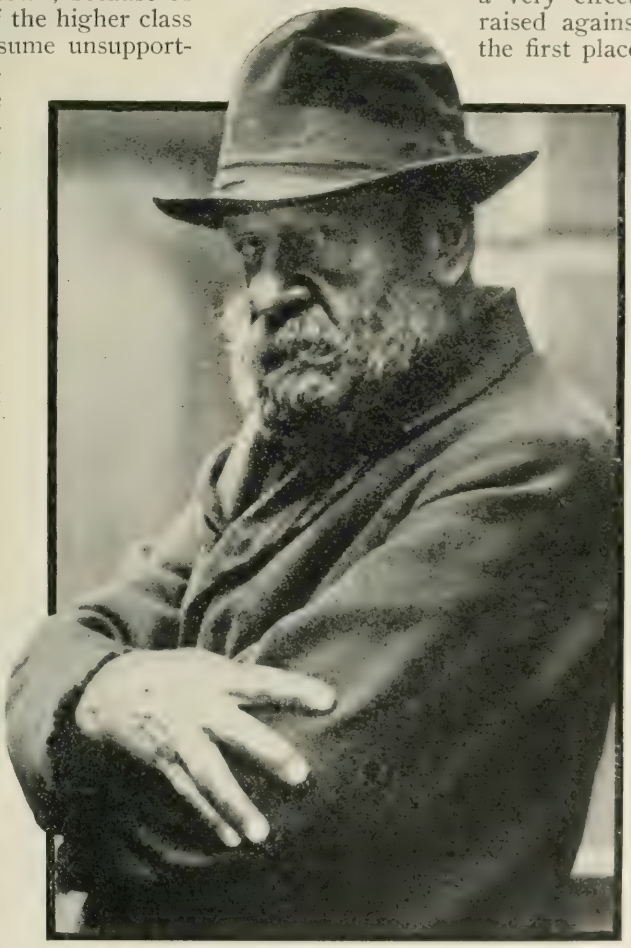
The upshot of the deliberations is that the government proposes to introduce legislation in accordance with the recommendations of the the commission. Precisely how it is to be framed or what form it will assume by the time the statute book is reached it is impossible to state, but the framers have had the advantage of studying the various arrangements already in practice and can model the scheme in accordance with the best features of of each. Certain it is, however, that the government in deference to the urging of its advisers, will advocate the compulsory state-subsidized system, as the voluntary method has completely broken down wherever it has been tried.



Is There a Possible Position for Him?
Looking over the "want ads."

"If they adopted the voluntary system of unemployment insurance they were always exposed to this difficulty. The risk of unemployment varied so much between man and man, according to his

qualities, character, temperament, demeanor to his superiors, that a voluntary system of unemployment insurance which was state-subsidized always attracted those workers who were most likely to be unemployed. Voluntary systems accumulated a preponderance of unemployed fatal to its financial stability. On the other hand the compulsory system of insurance, which did not add to the contribution of the worker from outside had also broken down, because of the refusal of the higher class worker to assume unsupported the burden of the weaker members of the community." In this statement Mr. Winston Churchill, the Home Secretary, cogently pointed out the disadvantages of the voluntary system.



The "Hobo."

There is, however, a powerful feeling against the scheme in any form. The malcontents urge that it is placing a premium on unemployment, and has a tendency to create paupers. Even some of the better class workmen are opposed to the idea, as they see visions of the wasters, and work-shys benefitting at the expense of the bona-fide industrious who would willingly work if they could. It hits at the sturdy independence which has always been the chief characteritsic of the workman, so they also maintain. But under state control no such qualms need be entertained. Drastic measures will be formulated for dealing with the won't-work-at-any-price, and already labor colonies have been advocated for those worthies which so sully the reputation of the genuine working man.

When the municipally subsidized unemployment insurance scheme was inaugurated in the German city of Cologne a very effectual barrier was raised against the hobo. In the first place it was only restricted to the winter months, and unless the person thrown out of employment had resided for a year within the city, followed a definite trade, and had paid his subscriptions regularly for thirty-four weeks in the year, he failed to qualify for any benefit. Then again if his premiums fell four weeks into arrears he also failed to receive any benefits. In this particular case the unemployed receives 50 cents a day for the first twenty days of enforced idleness, followed by 25 cents a day for another twenty-eight days. He can only receive benefit therefore for a sixth of the year at the utmost. The scheme is admirably administered but its sphere of influence is so severely limited that the

IN A TEN-CENT LODGING HOUSE.

idea is to be completely remodeled, as it imposes hardships where none were originally intended or suspected. In the process of overhaul it is being endeavored to place the arrangement on all fours with the scheme in vogue at Ghent in Belgium, and which is generally considered to be the most efficient system of voluntary unemployed insurance.

This scheme was formulated ten years ago, and it has so improved from year to year that it is generally regarded as the nearest approach to the ideal solution of the idea, that is upon voluntary lines that has yet been evolved. But the drawbacks incidental to voluntary assistance are just as accentuated in Ghent, as at all other places where it has been copied.

There is a management committee appointed by the municipality and the contribution is based upon a percentage of what the unemployed workman receives from his union, for the assistance is extended to him through the trade unions, so that the genuinely deserving may reap the real benefit. Just what this percentage shall be is determined once a month, and is governed by the determination of means and necessities, but in any case the assistance cannot exceed one hundred per cent of that afforded by the union, or nineteen cents per day per man. Such may be paid for a maximum of sixty days in one year. Certain conditions are imposed to coincide with local requirements, but taken on the whole the system works smoothly—at least as much so as it is possible with a voluntary system.

The great difficulty in any insurance scheme is to determine whether the unemployment is due to any cause beyond the man's own control, and the decision of what is "suitable work" for a person in search of such. Certain specific rules must be laid down to govern these points in any rational state scheme. Such is admitted. But how can these points be decided? Well in this respect the British government have elaborated a safe and sure method with the newly opened labor exchanges, designed to bring employers in need of workmen in one part of the country into touch with mechanics looking for work and residing in another. James Robinson is thrown out of employment at Steeltown because parts of the works are closed down for lack of orders. Ironville, two or three hundred miles away, is humming with a glut of work, and a sufficient number of hands cannot be obtained locally. Now it is obvious that if Robinson could be transferred to Ironville he could set to work as there is an opening for him. This is

precisely what the labor exchanges do. Robinson after leaving his job at Steeltown goes to the labor exchanges in that town, and registers his name. He gives full particulars concerning his qualifications which the officials enter up in as detailed a manner as if he were a prisoner entering a penitentiary. In return Robinson receives a ticket which is available for a certain period, at the lapse of which he must make another appearance. The employer at Ironville, looking for men, communicates with the labor exchange in Ironville, gives detailed particulars as to just what class of artizans he requires. These are circulated to labor exchanges in all other centers, among them Steeltown. Robinson is communicated with and is informed that he can get a job at such-and-such a wage at Ironville. He is willing to take it, but unfortunately has not the wherewithal to get to Ironville. The labor exchange provides the necessary, and he is transported to Ironville, repaying his advance for transportation charges from his wages in a certain period. In this effective manner employer and employee are brought into communication in every and any industry. There are no charges to either one side or the other, and the state financial advances are made without interest.

By such means the government finds out exactly who are genuine unemployed and who are work-shies. Smith, also thrown out of work at Steeltown for the same reason as Robinson and in the same trade, has an equal opportunity to go to Ironville. He refuses to do so, preferring to kick his heels about Steeltown where there is no work and not likely to be for some time. He is living on the relief of his union, and at heart does not intend to work, if he can help it, for a time, preferring a holiday at someone else's expense, i. e. his union. In due course his ticket of registration at the labor exchange expires and he applies for a new one. At the exchange the officials refer to his original docket, find that work was offered to him on such and such a date, why did he not take it? Smith hums and haws, but the official is inexorable. He wants a straight answer. Smith proffers an excuse. Very well we'll investigate, and the machinery is set in motion. Smith receives, in due course, intimation from his union that he is not playing the game, and further excuses proving abortive, he finds his union relief summarily

DISTRIBUTING FREE COFFEE AND ROLLS TO CHICAGO'S UNEMPLOYED.

A Hopeless Case.

stopped, on the plea that he is a shirker. Moreover he is black-balled at the labor exchange, and unless he instantly mends his ways he finds himself catalogued among the hoboes. With the national scheme of insurance against unemployment Smith would under these circumstances find himself in a very unenviable position, for the state has guaranteed absolutely that no assistance whatever will be granted to any but the bona-fide unemployed. Such men as Smith, when the scheme gets under way will find that "won't work" will mean "made-to-work," for the state labor colonies for the loafer, must be an inevitable corollary to the insurance system, to rid the community at large from a pestilential nuisance.

Norway and Denmark have both inaugurated state-assisted insurance schemes and here the projects were so devised as to meet those cases which hitherto have been deprived of benefit. All insurance which is administered through trade unions must hit the non-unionist adversely, for obviously the trades union is not going to push forward the claim of a black-leg, however deserving it might be. But why should the non-unionist suffer, and why should he be compelled to join a union if his inclinations are opposed thereto? Norway and Denmark set themselves to answer this question. By their arrangements relief is extended to the unorganized working classes as well. This position is adequately met by the compulsion levied upon the unions to receive premiums for insurance upon exactly the same terms as unionists from non-members. But on the other hand non-members are not permitted to have any voice in the elaboration of rules governing its administration, and if the union takes over the responsibility and cost of disbursing relief, well, the non-members have to pay for it, to the extent of an increase of ten per cent in the amount of their premium. If this increase is not sufficient the government can decide that the premium shall be enhanced fifteen per cent.

This attempt to deal equitably with unionists and non-unionists provoked bitter political warfare. The scheme was legislated in 1906 in Norway and the social democrats fought the point tooth and nail. They even went so far as to introduce a bill to repeal this obligation to carry out the insurance of unorganized work-people, although the latter were paying their own way, but it met with ignominious defeat. Bitterly mortified at this turn of affairs the unions point blank refused to assist the government, and it was not until the state undertook to increase its subvention from twenty-five to thirty-three per cent of the benefits paid that they came into line.

On the other hand, in Denmark the matter has proceeded on smoother lines but only because the trades unions there are so strong. Probably there is no

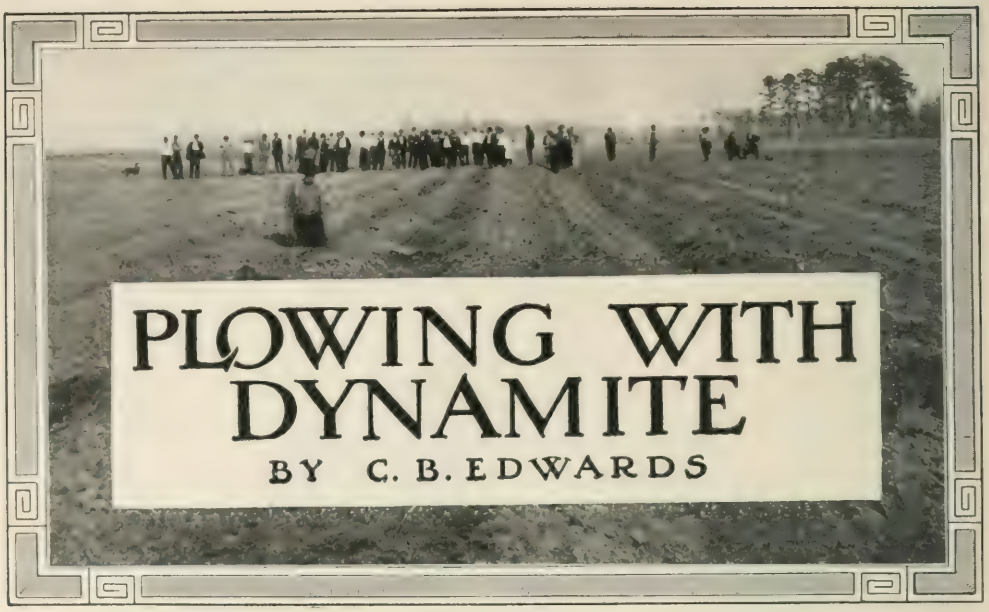
other country in the world where labor is so organized as in this little country. According to the law any workman can participate in the benefits so long as he complies with the imposed conditions. But should adequate reason be given to the managers of the funds that such and such a workman is not deserving of relief, well it is within the discretion of the officials to say yea or nay to further relief. Within a year of the passing of the Act 75,000 workpeople had qualified for the receipt of state unemployed benefits and today the sum of the municipal grant in Copenhagen alone stands well over $35,000. In Denmark, however, the recipients do not receive the relief in the form of money. If such were done the authorities are suspicious that it would not be turned to beneficial account. Instead, the relief is given in the form of transportation charges from one area to another, to achieve the same end as the labor exchanges in Great Britain, contributions towards rent, small daily cash allowances, and goods in kind, that is, necessities of life.

In Denmark this method of relief has worked admirably, but such would be repugnant to the characteristics of the citizens of another country. In whatever form state insurance against this burning question is extended, the national traits and demeanor of the workpeople must be taken into consideration.

CENSUS MAN ENROLLING THE UNEMPLOYED IN CITY HALL SQUARE, NEW YORK.

That the problem will have to be handled in this country in a short time cannot be denied, for there is no blinking the fact that unemployment is commencing to assail the United States in the same manner as it has already afflicted countries in the Old World.

This is only one phase of the so-called "labor question," but it is certainly a phase that will eventually have to be answered in no uncertain terms.



PLOWING WITH DYNAMITE

BY C. B. EDWARDS

J. HENRY CALDWELL, of Spartanburg, N. C., is the first man to utilize commercial dynamite in plowing land.

Up to the present time the soil has been stirred or "broken" by means of a turn plow. This common implement, drawn by one or two horses, breaks the land only to a depth of four or five inches and this is insufficient for the clay soil of the compact sticky character which exists on the large farm of Mr. Caldwell. The toe of the plow moreover acts upon the substrata of clay just as a plane does on a plank. It smooths or dresses the clay and packs it so that it will hold water. When seasons of heavy or excessive rain are encountered the plowed top soil floats off and leaves the land devoid of the necessary plant food which the crop to be grown must have. The result is that more money must be spent in fertilizing the field, else by a plentiful use of manure the land must in some way be brought back to its former condition of fertility. It has been demonstrated that a farm such as Mr. Caldwell's, which is located largely over hard pan, cannot be fertilized to the extent that it should be. At every unusual fall of moisture the costly fertilizer will be washed off the land on to that of a lucky neighbor. In any event the fertilizer on such land will only penetrate to a depth of four or five inches, the hard pan effectually preventing the further ingress of fertilizer and making the plant food available only to the surface roots of the crop grown. In order to overcome this difficulty and allow the fertilizer to sink far in and become a permanent reserve of plant food in the soil it is at once apparent that the land must be broken to much greater depths than is possible with the ordinary plow. This is nothing new, it is true, for the subsoil plow has been used for many years back and is a direct result of reasoning along these lines.

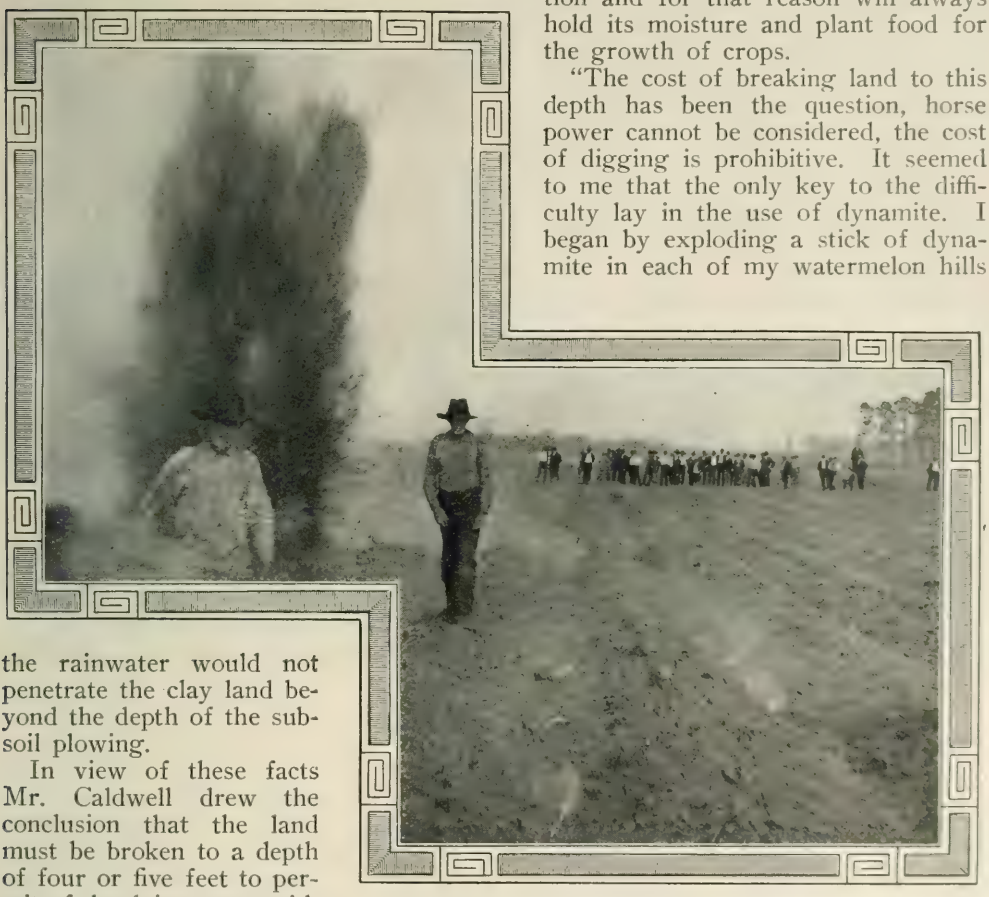
But Mr. Caldwell has used a subsoil plow on his land and declares it totally unfit for use on clay or hardpan land. The subsoil plow is a heavy T-shaped steel implement. In use, the top part of the T goes along at the intersection of the surface soil with the subsoil and cuts the soil at a distance of about a foot from the surface. The subsoil plow gives no mixing movement to the under strata, nor does it do more than simply give the soil a slight ventilation. The subsoil plow, on account of the depth at which it works, is also very hard on men and horses and it is impossible to plow over two acres a day in the clay land on Mr. Caldwell's farm. While the effects

of subsoil plowing were beneficial in a way and showed results in a slight increase in crop production, the result as a whole was not satisfactory. When the subsoiling was done on clay land Mr. Caldwell found that the subsoil plow broke up the capillary attraction that allowed plants to draw on the subsoil in times of drought, and in times of rain the rainwater would not penetrate the clay land beyond the depth of the subsoil plowing.

In view of these facts Mr. Caldwell drew the conclusion that the land must be broken to a depth of four or five feet to permit of the doing away with terraces to prevent the washing of the surface soil. He had observed that where stumps are pulled or any deep excavation made and filled the land where such excavation has been made grew much better crops than the surrounding soil. The crops over such spots did not wither with drought and in time of rain the surface soil with its valuable plant food was not washed about. The experimenter says:

"I have had occasion to open graves that have been dug for fifty years and the earth is soft and permeable to the bottom. I have opened old wells that have been filled and could follow the sides all the way down by the difference in the density of the soil. My conclusions from these observations was that clay once disturbed to a depth of four feet will never pack to its original condition and for that reason will always hold its moisture and plant food for the growth of crops.

"The cost of breaking land to this depth has been the question, horse power cannot be considered, the cost of digging is prohibitive. It seemed to me that the only key to the difficulty lay in the use of dynamite. I began by exploding a stick of dynamite in each of my watermelon hills and the resulting increase amounting to thirty-three per cent. of the crop allowed me to pay for the dynamite and have an increased profit besides. I next tried plowing a cotton field in the usual manner, and after plowing harrowed it thoroughly and charged two acres of it with seventy-five pounds of dynamite to the acre. The dynamite



THERE IS VERY LITTLE DANGER FROM THE EXPLOSIONS.
One man is within three feet of the exploding charge.

cartridges were put two feet apart in rows marked with a single shovel plow. The method of planting the cartridges was simple: one man walked ahead with a crowbar and stuck it into the ground about three feet; the man following affixed a percussion cap to the stick of dynamite and two feet of fuse and tamped it into the hole with a rake handle finally leaving only the white fuse protruding. Incidentally the dynamite used was of the strength ordinarily used for blasting stumps and is not as costly as that used in rock quarries.

After the planting of the dynamite out and the sheriff instructed to hold up the exploding of the charged field, made a formal call upon Mr. Caldwell to come to an agreement in regard to the inevitable damages which the neighbors felt sure would ensue.

In exploding the field, four rows were set off at a time, one man going rapidly down each row lighting fuses with a red hot iron as he went. The result was not unlike the setting off of a great bunch of firecrackers. The explosions came thick and fast and both the sub and surface soils were sent into the air in clouds again falling on the land in a powdery

FIRING THE CHARGES.
The men walk down the rows, setting off the fuses with red-hot irons. Notice the white fuses.

charges a large crowd of the native population gathered near the field of operations to witness what they regarded as the novel whim of one of their most progressive farmers. The negroes of the locality did not know what to make of the proceedings and looked with awe upon the operations calculated to wrench from nature the productive crops she refused to yield to their simple methods. The exploding of the charged field was not without its amusing side. Many of the nearby neighbors hearing that several hundred pounds of dynamite were to be exploded removed household belongings and adjourned to their farthest premises, window frames were taken mist and leaving periodical holes where the cartridges were planted about four and a half feet deep. In one case where twelve rows were set off at the same time the effect was quite awe-inspiring, the reports were blended into a continuous roar and the row of a dozen men lighting fuses were pursued by an ever rising wave of soil. The danger to the men lighting the fuses is trifling as is shown by the photographs of the operations.

After the charges are exploded the field looks not unlike a great colander set with innumerable holes where the charges of dynamite were set, and the soil is broken up into unusually fine particles and well aerated.

CORDOVA AND VICINITY, SHOWING THE TRESTLE-WORK FOR THE RAILROAD.

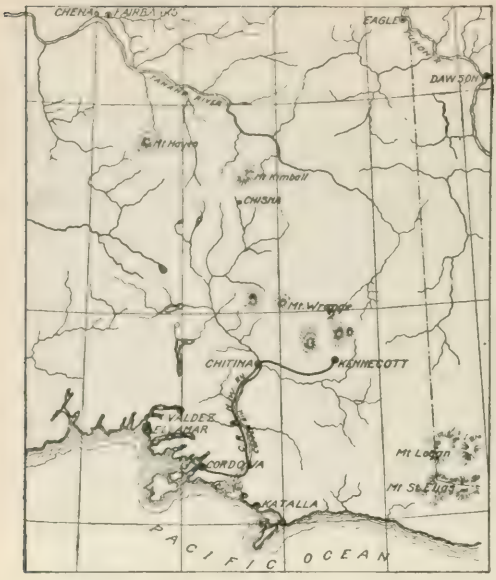
BUILDING OUR MOST NORTHERN RAILWAY

By

WILLIAM THORNTON PROSSER

THREADING its way along the sides of mountains, dodging great glaciers, and crossing and recrossing wide streams, the Copper River & Northwestern Railway will be completed before the end of this year from the Gulf of Alaska to the rich copper mines of the interior, a distance of two hundred miles, giving to the Morgan-Guggenheim interests the most northerly railway system on the American continent. True, two or three mining railways are in operation still farther to the northward in Alaska, but none rises to the dignity of a railway system on the same gauge and scale as the big lines of the States. Slightly more than one hundred miles of the Copper River railway were completed at the opening of the present season, with more than two years of active operations. The contract calls for the completion of the remaining distance by November 30. Seeming impossibilities must be accomplished by the builders within the next few months in the execution of the contract.

Particular interest is given the new Alaska railway at this time because of the congressional investigations into Alaska



DISTRICT TAPPED BY NEW RAILWAY.

W. J. HENEY.
The contractor who is building the Copper River Railway.

E. C. HAWKINS.
The chief engineer and general manager of the Copper River Railway.

railroad building and the coal land operations, involving the R. A. Ballinger-Gifford Pinchot national episode, and the part played by the Morgan-Guggenheim alliance in northern development, but aside from these features of popular interest the Copper River line is attracting attention in the railway world because of the difficulty of construction, the terms under which the contractor is operating, and the engineering problems involved. There is small likelihood the building of the railway would have been attempted had Wall Street foreseen the Alaska coal land controversy, for the opening of the coal deposits was regarded as of almost as great importance as the development of the copper properties.

However, the building of the road was well advanced, and several millions of dollars had been invested before the country at large knew that such a thing as coal existed in Alaska, and the enterprise could not well be abandoned. But the wonderful mountains of copper that exist in the vicinity of the Bonanza mine are certain to repay the expenditure of $10,000,000 that the syndicate is making. Mining engineers estimate that this northern copper—so nearly pure that it may be quarried out like granite—can be placed on the market perhaps lower than eight cents a pound, in competition with the twelve-cent copper of Montana, and the other producing districts. Copper, already the most widely used metal, entering every phase of our daily life, is constantly expanding its field of usefulness. Wise are those who plan the future control of the copper market.

In equal proportions, the banking house of J. P. Morgan & Co. and the Guggenheim smelting interests are bearing the expense of the Alaska railway enterprise. Actual construction of the line is left to E. C. Hawkins, chief engineer and general manager, and M. J. Heney, contractor, the men who built the White Pass & Yukon Railway, across the divide between the coast and the headwaters of the Yukon River. More spectacular was this earlier piece of railroad building, as the line climbed up the mountains over the famous White Pass, across which the stampeders of early days toiled to reach the Klondike. But the new Alaska line is much longer, and in many ways is more difficult of construction.

Three false starts were made before Cordova, the coast terminus of the line, was definitely selected as the base of operations. The Copper River offers the best gateway into the interior of Alaska, but a good harbor located advantageously with regard to the river was difficult to find. Valdez, on Prince William Sound, some distance to the north of Cordova, was originally selected as a base for railway operations, before the entry of the syndicate into the northern field. Considerable money was spent there, both by the Morgan-Guggenheim interests and their predecessors, but the grade between the harbor and the Copper River proved almost prohibitive. Then $1,000,000 or

more was spent at Katalla, on the eastern side of the river's mouth. A breakwater was constructed to protect the harbor area, but the depth of water was not sufficient for shipping and the harbor still remained exposed to the fury of storms that frequently sweep the Alaska coast. Katalla has many advantages, especially in its location with reference to the coal fields of the Bering Lake district, where the famous Cunningham group of claims is located, and an independent company has a railway projected the thirty-five miles to the coal deposits. But the syndicate, upon the advice of engineers, determined to abandon operations there and go to Cordova, where M. J. Heney associated with Close Brothers, of London, had spent half a million dollars in railway construction, the announced plan being to open the mines of the interior and build across to Fairbanks and the Yukon river. Close Brothers were the principal figures in the White Pass & Yukon line.

So Mr. Heney and his associates took the half million dollars they had expended on the Cordova project in stock in the new Copper River & Northwestern Railway Company, and Mr. Heney was given the contract for the building of the syndicate road. That was in the fall of 1907.

From Cordova, on a little shelf between the mountains and the sea, the rail line lies to the eastward, and then swerves north as it approaches the Copper River. Miles and Childs Glaciers, wide rivers of ice that are several hundred feet deep where they face upon the Copper, one on the east and the other on the west side, are only a short distance apart. To pass these it is necessary to cross and recross the Copper river. At first temporary bridges carried the rails, but within the last year these have been replaced by steel structures with concrete piers. Construction of the strongest character is necessary to withstand the ice floes of the winter season and the torrents that sweep down when the snows of the interior melt.

"Our line follows closely the course of the Copper and then of the Chitina river," said Mr. Heney recently. "We go through a rough country, with canyons, marshes and mountain sides as

CONSTRUCTORS' CAMP ON THE LINE OF THE NEW ALASKAN RAILROAD

CONSTRUCTION GANG BREAKING CAMP.

obstacles to be overcome. Some of the construction is extremely costly. One stretch of the line already built averages $75,000 a mile for twenty-five miles, while some of the work has averaged $100,000 to the mile.

"But in the work ahead of us this year lies the most costly piece of construction along the entire route, save for the steel bridge construction. This is in Wood's canyon, where it will be necessary to expend $250,000 to the mile for a considerable distance.

"Hundreds upon hundreds of tons of giant powder have gone into the construction of the roadbed. During the winter season the chief work carried on is in reducing the roughest places in the course so that the tracklaying may follow with as little delay as possible when the summer comes. All last winter we had about fifteen hundred men almost all engaged on sub-contracts, blasting out of solid rock a place for our rails. In these blasts from fifteen to twenty tons of giant powder are fired at a shot, shaking the country for miles around the site of the explosion.

"In some places the tracks run on ledges cut out of the cliffs several hundred feet above the river, and at others they are not more than a few steps from the high water mark. There is virtually a water level grade from the coast to the mines.

"One thing is certain—when the Copper River & Northwestern railway is completed it will afford to travelers some of the most striking scenery to be found on the American continent. The bigness —the majesty—of northern creation holds one enthralled. Man seems small indeed when measured against this mighty Alaskan land, where mountains tower from the sea into the clouds and the forces of nature seem without restraint. The time is coming when Alaska will be known as one of the wonder portions of the world."

But to return to Mr. Heney's problem —that of completing his contract before the beginning of December.

"If one does not undertake seeming impossibilities there is little chance of accomplishing anything in the North," he says. Of indomitable will, perseverance and boundless energy, he speaks as if no impossibility were too great for him to undertake. Yet the strain of the last year's operations in the Alaskan railroad work has shaken even his strong physique and at a critical time he has been compelled to leave to his assistants the task that is before him. A sojourn in California, his physicians believe, will make him ready for the summer's operations.

"I must have men, more and yet more men, 4,000 of them, if I am to turn the completed Copper River & Northwestern Railway over to the owners completed by November 30," he declared with emphasis, just as he started on his southern trip. "Every ship that sails from Seattle harbor for Cordova carries all the laborers we can get to make the trip, but the Alaska fleet has been seriously reduced by the loss of two vessels within the last few months. The Farallon was wrecked out to the westward of Cordova, and the Yucatan struck an iceberg and went down in Icy Straits, while southward bound from Alaska.

"The result is that it is going to be almost a physical impossibility to get the requisite number of men transported to the north, supposing that we can get enough applicants for the job. Railway work in the Northwest is now so heavy with the Hill and Harriman systems racing through central Oregon and employing an army of 10,000 men, the Northern Pacific, the Great Northern and the Milwaukee making extensions, and with other roads busy in half a dozen directions, so men are hard to find.

"Observation teaches us that Scandinavian workmen do best in the North as they are constitutionally suited to the latitude. Workmen from southern Eu-

TO THROW A RAILROAD BED THROUGH THIS COUNTRY IS A TOUGH TASK FOR THE ENGINEER.

rope, employed so largely on railways in the states, are not so good, nor do we find the Japanese especially well adapted. We do not apply any particular tests to the applicants for work, but we size up pretty carefully the men who appear at our Seattle offices. Only the physically capable are sent North."

It is the ultimate intention of the Copper River railway builders to extend their line across interior Alaska to Fairbanks and the Yukon river, doubling its length to the copper mines. A government trail extends now from Valdez to Fairbanks, and over this goes most of the Fairbanks traffic by stage in summer and sleds in winter. Next winter, however, a good part of this travel will be from Chitina, on the railway to Fairbanks, bringing that rich mining district, the greatest so far developed in Alaska, into much closer touch with the outside world.

Four claims in the Bonanza copper group are owned by the Morgan-Guggenheim syndicate. Testimony recently given at Washington, D. C., by representatives of the combine was to the effect that on these four properties at least $6,000,000 in copper showed on the surface, while experts have declared that the supply is almost limitless. The Bonanza mine itself is a veritable mountain of copper.

But even more surprising were the estimates made on the value of the coal locations in the Bering Lake district. The statements made by Stephen Birch, special agent and expert for the syndicate, were to the effect that the coal in the Cunningham group of mining claims, comprising a score of separate locations, was estimated to be worth $900,000,000. His testimony before the senate committee on territories indicated that the syndicate had obtained an option on a half interest in the Cunningham group. If title can be obtained to these rich deposits of coal, greatly needed upon the Pacific Coast, the Copper River & Northwestern will be provided with a branch

WILD COUNTRY THROUGH WHICH THE NEW ROAD WILL PASS.

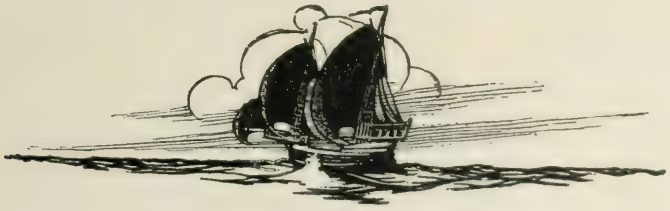
line tapping the fields.

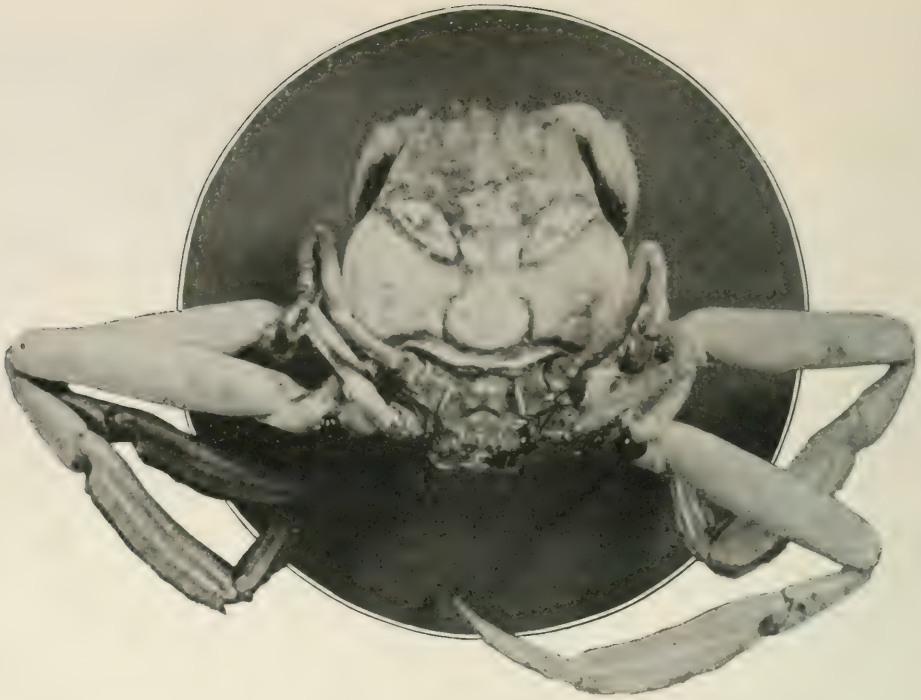
The plan under which the Morgan - Guggenheim operations are carried on was also brought to light. According to the statements of Mr. Birch the agreement was made verbally between the two interests, in 1906, that they should go ahead with the Alaska projects and entail a joint expenditure of $10,000,000.

Mr. Morgan became interested in Alaska through his son-in-law, William Hamilton, who had an interest in the gigantic corporation organized to dominate the salmon fishing interests of the Pacific Coast. When this combine, known as the Pacific Packing & Navigation Company collapsed Mr. Morgan took over the properties, and later became interested in the steamship business between Puget Sound and Alaska. The Alaska Steamship Company, the most important factor in northern water transportation, is a Morgan-Guggenheim concern. The Guggenheims became interested in the North through mining operations in the Klondike. They bought up the greater part of the pay dirt that had been worked over by the first miners in the district, and by the importation of great dredges are making millions out of low pay earth—the old dumps.

The Morgan-Guggenheim combination is the greatest factor to be reckoned with in the future development of Alaska.

THE TOWN OF CORDOVA.
A view down First Street.





BEARING THE FACE OF A JAPANESE WARRIOR, IT IS, NEVERTHELESS, ONLY A TAIRA CRAB.

NATURE AS A FAKER

By

RENÉ BACHE

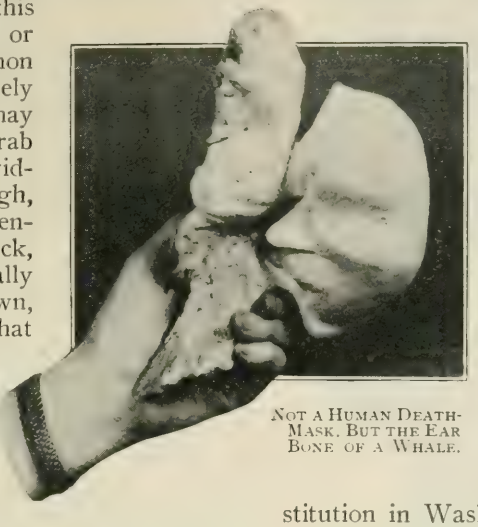
NATURE, in her imitative moods, seems on occasions actually to become sportive and jocular. For example, how, unless it were meant as a joke, is one to account for the remarkable Taira crab of Japan, which has recently attracted the attention of science?

Japanese tradition tells of a great naval battle which was fought in the Sea of Japan in very early times, many centuries ago. A force of piratical sea-fighters had assembled to oppose the doughty Japs, but was overwhelmingly defeated, the fleet being entirely wiped out, with no survivors worth mentioning. Since that day, according to the story, all the crabs of a certain species common on that part of the coast have borne on their backs the face of a Japanese warrior.

The face is there all right. It is in its way, indeed, the most remarkable thing in nature, the visage represented on the back of the crab being not only most human-like, but unmistakably Oriental. Furthermore, it is the face of a *drowned man,* with open mouth and greatly swollen features.

The idea popularly accepted in Japan

is that the Taira crab offers good evidence of the transmigration of the souls of the dead into the bodies of lower animals. Whether this notion be accepted or not, the phenomenon described is extremely interesting. It may be added that the crab in question is provided, curiously enough, with four supplementary legs on its back, so that, if accidentally turned upside down, it is able to run in that fashion quite as well as in its ordinary position. These extra legs are plainly shown in the accompanying photograph, at and below the corners of the mouth of the "warrior."



NOT A HUMAN DEATH-MASK, BUT THE EAR BONE OF A WHALE.

Dr. Bashford Dean, in a recent article of his own on this subject, speaks of the earbone of a whale, picked up on a Norway beach, which shows in a very striking way a human face. Furthermore, it is unmistakably a face of Scandinavian type, of low caste, with rounded cheek bones, flat nose-bridge, small upper lip, and receding jaw. The resemblance is almost absurd in its accuracy of detail.

It might be said, however, that the face looks rather the death mask of a Scandinavian fisherman than that of a living person. The ear-bone in question was that of a finback whale, and doubtless the same part of the osseous anatomy of any other whale of the same species would have substantially the same form. In fact, the accompanying picture was made by the writer from another finback's ear-bone at the Smithsonian Institution in Washington.

People all over the country are constantly sending curiosities of one kind or another to the Smithsonian, and many of them are what are known to scientists as "pseudomorphs"—that is to say, accidental imitations in nature. For instance, not long ago, somebody forwarded a piece of water-worn rock, which he declared to be a fossil human foot. It was undeniably very like a foot

A WATER-WORN PEBBLE, STRANGELY COUNTERFEITING A HUMAN FOOT.

THE PIGEONS IN THE FLOWERS.
Curious illusion of the holy ghost orchid.

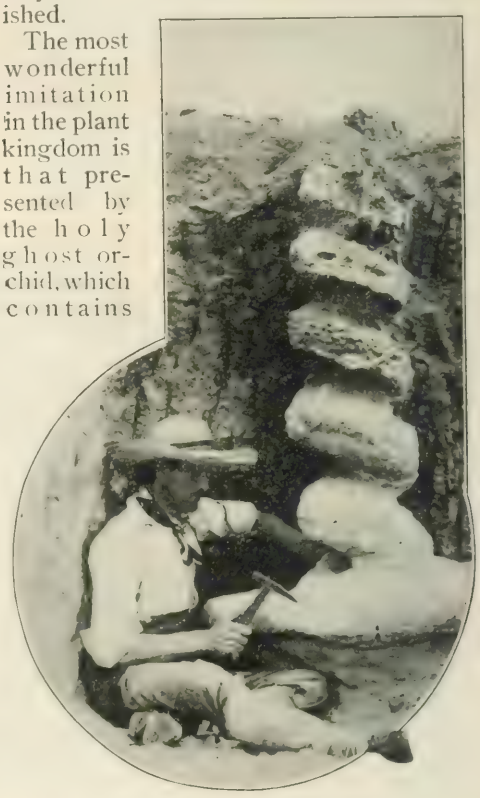
in shape and size. As in all such cases, the Institution, in acknowledging the receipt of the object and thanking the donor, was careful not to suggest that it might not really be a fossil foot. Experience has shown that people are liable to get angry if an attempt is made to shatter their illusions on such subjects.

From the weird region known as the Bad Lands arrived, not long ago, what was declared to be a fossil ham. To prove that there was no mistake, the bone was actually sticking out of one end of it. But expert examination showed that the so-called bone was in reality the shell of an extinct rod-shaped mollusk known as a "baculite." As for the "meat" surrounding it, that was merely an accidental agglomeration of stony stuff.

Thickly scattered over an area of at least five hundred square miles in Nebraska, chiefly in Sioux County, are the so-called "devil's corkscrews"—otherwise known as "fossil twisters." Some of them are as much as forty feet long. All over that region they may be seen projecting from the sides of cliffs, and in other places where the rocky formations have been worn away by water and wind—vertical spirals of quartz embedded in sandstone, their symmetry absolutely mathematical. It is difficult to realize that they are works of nature, and not of art.

Until very recently the origin of these "corkscrews" has been an unsolved problem. Many theories were advanced to account for them, one of the most widely accepted ideas being that they were the fossil burrows of a huge extinct species of gopher. But it has been practically decided that they are petrified waterweeds, which, of enormous size, grew on the bottom of a vast lake which covered Nebraska some millions of years ago. In the course of time they were buried by sediment, which, transformed into rock, has preserved them for the astonishment and instruction of a race of human animals which had not made its first appearance on the earth at the period when they flourished.

The most wonderful imitation in the plant kingdom is that presented by the holy ghost orchid, which contains



QUARRYING OUT A "DEVIL'S CORKSCREW."
Note the huge root.

within each of its blossoms a pigeon with half-spread wings. Indeed, the bird is so perfect that it looks as if ready to take flight. The plant, which is native to the Isthmus of Panama, is exceedingly rare—so much so that there are probably not more than half-a-dozen specimens in the United States, including two in the greenhouses of the White House at Washington. It grows sturdily, but, in order to thrive, has to be kept in a hothouse with the temperature of a Turkish bath.

Another very curious plant, which has been famous since very ancient times, is the "Scythian lamb"—otherwise known as the "vegetable lamb," or by the Chinese, as the "golden-haired dog." It looks remarkably like an animal, and in early days was popularly supposed to combine in some mysterious way the attributes of animal and plant. The belief was that it sprang from a seed, and turned on its root until it devoured all green food within reach, whereupon it perished of starvation. As late as the seventeenth century it was much prized as a magical drug in Europe. Truth to tell, however, it is merely the root-stock of a plant, which, densely covered with soft, golden-brown hairs, suggests a likeness to a quadruped.

COURTESY OF THE EASTERN LOGICAL NEWS.

CRYSALIS OF A BUTTERFLY.
An extraordinary resemblance to a human face.

MOTHS THAT IMITATE THE LEAVES OF TREES.

In New Zealand there is a strange plant known as the "vegetable sheep," by reason of its wool-like foliage. But, when one gets into the vegetable kingdom, one finds no end of curious imitations. Dr. Bashford Dean calls attention to the common garden snapdragon, the seed-pods of which look like diminutive human heads arranged on the stalks like "poles of skulls," such as are set up in certain countries where head-hunting is a popular amusement. These show not merely the head and face, but dried portions of the scalp, eyelids and lips. Their color is like that of mummied heads.

Pansies often have rather striking faces. It is curious to walk around a circular bed of

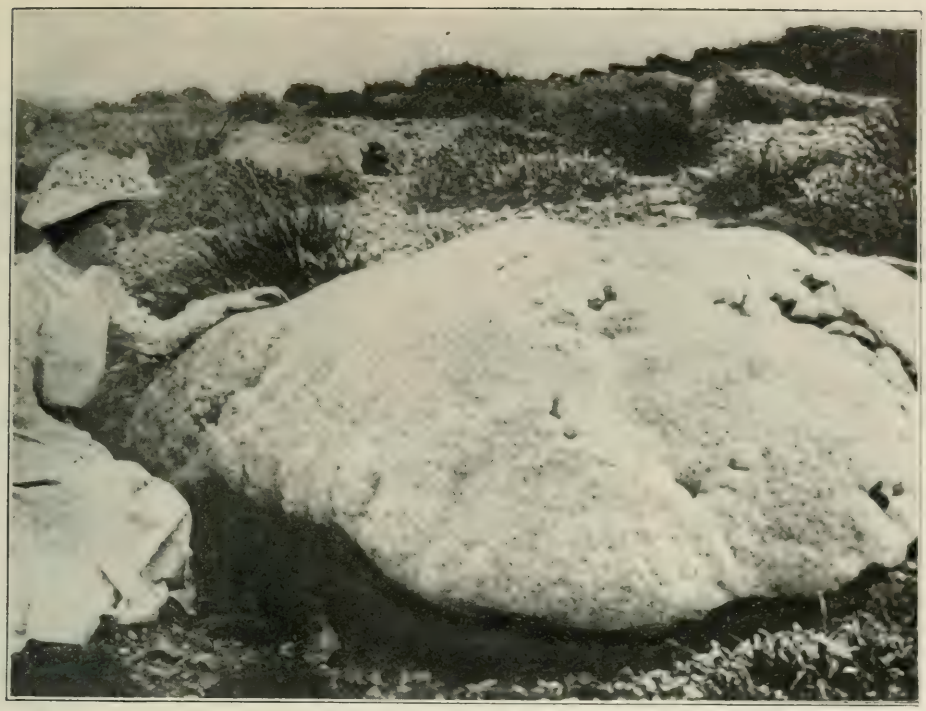
them, and to observe that, on whichever side one stands, the flowers seem to be looking at one, as if they turned and followed. Here, of course, the imagination is largely concerned. Much more odd, in their way, are the Oriental written characters which appear on squash seeds after drying. They are mere irregular markings, due to contraction, but it is said that Japanese men of learning have made earnest efforts on occasions to read them and find some meaning in them.

"Measuring Worm" Imitating a Twig.

The insect world is full of mimicry. Butterflies that imitate dead leaves are familiar, and the same may be said of the "walking stick," which bears so close a likeness to a twig that, though common enough in the woods, it is rarely detected and captured. The "measuring worm" assumes the attitude of a twig, and remains motionless for hours together. Moths, to protect themselves against enemies, mimic wasps, and other harmless insects adopt the aspect of spiders.

Native to Africa is a remarkable insect, a species of Spalgis, the chrysalis of which looks like the head of a chimpanzee. Even the hair and the pupils of the eyes are shown. But more wonderful yet is the chrysalis of a butterfly, Feniseca tarquinius, which is a likeness,

THE FAMOUS "SCYTHIAN LAMB," A PLANT WHICH CURIOUSLY IMITATES A SHEEP.



THE VEGETABLE SHEEP OF NEW ZEALAND.

seemingly a mask, of the Roman king, Tarquin.

On the other hand, a certain species of mollusk is called Pupa, because its shell looks exactly like the pupa, or chrysalis, of an insect. There seems to be no end to imitations of the kind in nature. Dr. Dean, who jokingly refers to them as examples of "unnatural history," speaks of the fact that the "sphenoid" bone at the base of a rabbit's skull pictures the head of a fox, its arch enemy, with such striking accuracy that it has long been used as a scarf ornament by fox hunters in England.

Among recent volunteer contributions to the collections of the Smithsonian Institution was a "petrified oyster." It looked very much like a real oyster, opened on the half shell; and, as if to complete the verisimilitude, it even contained a fossil pearl. But, as a matter of fact, the pearl was merely a "concretion," and the oyster itself was not an oyster at all, but a mineralogical freak.

Concretions often assume queer forms. A pebble in a stream gathers about itself grains of sand until an odd-shaped lump is made. A favorite shape for such lumps seems to be that of a turtle, with four legs, a head, and a tail. Similar concretions of carbonate of lime or clay assume the appearance of petrified peanuts. If one of them be broken, there is revealed a small spiral "winkle" shell, which has served as a nucleus. An interesting counterfeit of this kind, forwarded to Washington not long ago, was an alleged fossil foot of a child, with a little stocking on, the latter showing signs of wear on the ball of the foot and on the heel.

In the rocks of the so-called Table Mounds, in Iowa, are many distinct prints of cloven feet. It was formerly supposed that the devil, or possibly some of his imps, had visited the place. But recent study of the subject has shown that the prints in question are merely impressions left behind by a mollusk-like animal known to science as Pentamerus, ages ago, before the rocks had hardened—at a period, that is to say, when they were merely so much mud on

the bottom of an inland sea which then covered all that part of the United States.

It is very easy even for scientists to make mistakes in such matters. Certain markings on sedimentary rocks, long supposed to be fossil prints of algæ and other plants, which actually received names and were classified in botanical genera and species, are now known to be in reality tracks made by mollusks, insects, and worms. One of these alleged plants, frequently catalogued, was proved to be the trail of the larva of the dragon fly, which is an aquatic insect in its early life.

Many facts of this kind have been revealed by the ingenious experiments of Prof. Charles D. Walcott, the present Secretary of the Smithsonian Institution.

SCENIC THRILLERS IN THE ROCKIES

By

ARTHUR CHAPMAN

ENTERPRISING Western railroad men have seized upon the popularity of the various "thriller" devices that have proved so effective at various summer gardens, and are fairly outdoing them in the Rocky Mountains.

Stepping into a car on the plains in the foothills and being hauled to the top of a high mountain by a wire cable is one of the pulse-accelerating amusements now provided for tourists in Colorado. The owner of the device, who has opened a pleasure resort in the foothills near

THE INCLINE RAILWAY AT MT. MORRISON, NEAR DENVER.

Denver, built this remarkable tram system, a steel cable lifting carloads of passengers to the top of Mount Falcon.

TRAIN AT SUMMIT OF MT. McCLELLAN, COLORADO. ALTITUDE 11,600 FEET.

At Silver Plume, Colorado, a mining camp which nestles in the bottom of clear creek canyon, some enterprising promoters conceived the idea of carrying passengers in the aerial trams which swung back and forth from one of the mines, high up on the mountainside. So, instead of ore, the buckets now carry passengers during the tourist season, and

the pay per ounce has proved more profitable.

The supreme thrill in actual railroading, however, is provided by the Argentine Central Railroad, which a few years ago was used solely for carrying ore from the Waldorf mine, high up on Mount McClellan, a shoulder of Gray's Peak. Rev. E. J. Wilcox, one of the promoters of the mine, conceived the idea of converting the road into a passenger line. From Silver Plume the road ascends in a series of thrilling switchbacks to a height of more than 14,000 feet above sea level. This road is now the highest actual railroad in the world, having no cogs nor cables. The motive power is furnished by specially constructed mountain-climbing engines.

Such devices for the amusement of the summer tourist make the summer park scenic railways and chute-the-chutes seem tame in comparison. More "thrillers" are being planned, and Colorado, with more than two dozen mountain peaks over 14,000 feet high, seems able to supply all the scenic background that the promoters can ask.

PUTTING THE BAN ON FLOODS

By

HARRY F. KOHR

KANSAS CITY has undertaken the costliest job of flood protection ever planned by any inland city in America. Present plans contemplate an expenditure of close to $5,000,000. Perhaps before the work can be said to be complete it will have cost a couple of millions more. Of the smaller amount, Kansas City, Kansas, already has voted two million dollars in bonds, the remainder being the estimated amount to be expended by the railroads and private interests in the work to be done under government and drainage district order and voluntarily for their own protection.

A SINK HOLE IN THE SANTA FE YARDS. FIVE LOCOMOTIVES AND SIX PULLMANS SANK HERE.

THE MISSOURI PACIFIC BRIDGE AFTER THE WATER HAD FALLEN THREE FEET.
Like an island in the flood, weighted down with all the locomotives that could be placed on it.

Kansas City, Missouri, and the federal government will also spend a large amount of money, probably close to a million dollars altogether for the work of protecting property in Kansas City, Missouri, and moving the mouth of the Kaw so that it will not flow, as at present, directly against the current of the Missouri and thus make worse a bad situation.

Before 1903 Kansas City, speaking of the two cities as one, never had known a serious flood. In May of that year a series of unprecedented rains sent a volume of water down the Kaw Valley that filled it from bluff to bluff and caused the greatest loss, according to government report, that any American city ever suffered from a flood. Some estimates of the damage of that flood alone run as high as $35,000,000. United States government engineers who investigated the flood and its causes said that their very lowest estimate of the damage would be $25,000,000 and it certainly wasn't any less.

CONCRETE WALLS BUILT AROUND PACKING HOUSES TO KEEP OUT FLOOD WATER.

Of course, Kansas City hasn't really waited this long to do something, but heretofore it has been prevented from doing it by lawsuits brought by railroads and other corporations affected. The corporations desired to do one thing and the people, through their drainage district board, another. Finally, the corporations decided to do as the people desired and dropped the suits. Besides, they will get out of it cheaper than they would under their own plan, which involved the digging of an entirely new bed for the river where it runs through Kansas City, Kansas, at an estimated cost of nearly seventeen millions.

The railroad plan would have involved three years of work and the people demanded immediate protection. The latter had no assurance that the flood wouldn't be repeated this year and the next, and by that time they wouldn't have anything to protect.

Beginning at Turner, Kansas, a few miles west of Kansas City, the Kaw River forms a half circle to its mouth. Originally the channel was 850 to 1,000 feet wide, but gradually the railroads and other industries encroached on the

MISSOURI PACIFIC YARDS EAST OF KAW RIVER AFTER FLOOD HAD RECEDED THREE FEET.

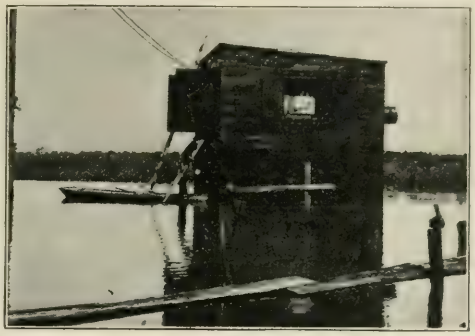
channel until in some places it was reduced to a width of hardly more than 400 feet. Inside the half-circle formed by the river lies Armourdale, and outside of it lies Argentine, the seventh ward of Kansas City, Kansas; Rosedale, and the first ward of Kansas City, Kansas, and the West Bottoms of Kansas City, Missouri. So far as any one can see it is all one city. In the valley subject to overflow are the yards, freight houses, elevators and shops of ten big railroads, the passenger terminals of nineteen railroads, the second largest aggregation of packing houses in the world, the second largest stockyards, the largest wholesale farm implement business in the world and a vast number of smaller industries and business. More than 25,000 persons live in the district and many thousands more find their daily employment there.

A City Bridge With Four Other Bridges Within a Stone's Throw of One Another.

The flood of 1903 poured into the Kaw River at Kansas City approximately more than 350,000 second-feet of water. The channel which ordinarily carried only a few thousand feet took what it could and spread the remainder through this huge business district from bluff to bluff. On the main street of Armourdale it was twenty-five feet deep. In its original channel the Kaw would have carried off that huge volume of water with only a small overflow, but, restricted as it was, and blocked by low bridges, it scarcely could carry one-fourth of the water that rushed through the valley like a mill race and swept everything before it. Fifteen of the sixteen bridges that spanned the stream in the two miles above its mouth were swept away. Weighted down with sixteen big locomotives, the Missouri Pacific bridge, the newest and heaviest of them all, stood throughout the flood, to be ever since a constant source of trouble by forming a dam and making subsequent floods worse than they otherwise would be.

The flood was repeated in 1904 in less volume and again in 1908 and 1909. In the other years the water was high, but not high enough to do any great amount of damage. But four floods in seven years is too expensive a luxury for any town.

While the flood protection works in themselves involve no great engineering difficulties, the number and variety of the things necessary to be done before the flood protection is complete are, in the aggregate, a work of great magnitude. The work of the drainage district board will comprise the building of fifty thousand feet of levee ranging from ten to twenty-five feet in height and seventy-five to 100 feet wide at the base. At the same time, the channel of the river where it is narrower—in one place it has been narrowed to 400 feet — will be widened to a least width of 734 feet and the channel dredged to a depth of fifteen feet below the present low water mark. In that channel are unnumbered tons of steel and stone debris from wrecked bridges, steel rails, car trucks, several locomotives and crushed tank cars and the jumble of junk left by the big flood of 1903. All this must be removed and with it thousands of tons of sticky, black, ill-smelling mud, the foul accumulation of years of packing house and stockyard refuse. In its balmiest days the Chicago River never had anything on the Kaw in the variety and evil of its smells.



WHERE SEWERAGE IS PUMPED INTO THE RIVER IN TIMES OF FLOOD.

The mud and earth removed in the widening and the deepening of the Kaw will be used to build the levees along the harbor lines. These levees when settled and rounded up will be revetted with heavy stones to prevent erosion by floods. Finally, the mouth of the river must be moved a quarter of a mile to the southeast so that the waters of the Kaw will flow out and with the waters of the Missouri, the parent stream, instead of directly against them, this present condition being one of the conditions that makes the Kaw floods worse. Incidentally, the grades of all of the streets must be raised from three to twenty-five

KANSAS AVENUE, THE MAIN STREET IN ARMOURDALE, AFTER THE FLOOD.

feet for a distance of a block to cross the levees, five bridges must be raised and lengthened, flood gates must be put at all of the sewer outlets and pumps installed to care for the sewage during floods. New rights of way must be provided in several cases for railroads whose present rights of way are taken, property must be bought and buildings torn down.

Compared with what the private interests must do to be saved from the floods, the city's share will be a small job. First there are ten big steel bridges to be raised an average of seven feet and lengthened from 120 to 300 feet, and under each new piers resting on bed rock must be placed. This must be done while the bridges are in constant use day and night, carrying besides the vast railroad freight traffic, the great intercity traffic of close to half a million people, including five lines of street railway. The changes in the elevations of the bridges makes it necessary to raise the grade of hundreds of acres of railroad and stock yards from three to seven, and in some places, ten feet, necessitating a great rearrangement of terminals for at least three of the railroads. One belt line railroad must rebuild several miles of track which are now within the harbor lines. Several miles of switches must be torn up and relaid elsewhere. A hundred or more houses and buildings must be torn down and in some cases rebuilt, and a strip of stockyard pens 150 to 200 feet wide and more than a mile long torn down and rebuilt.

That is all in Kansas City, Kansas. Kansas City, Missouri, must build several miles of levees, build sewer flood gates and install sewer pumps.

MAKING OVER SEATTLE

By

FRANK C. DOIG

SEATTLE, the seaport of Puget Sound, finds itself cramped for room. This city has grown up on what was originally a narrow strip of land bordering Elliott Bay. Rising abruptly from the water, were hills several hundred feet high. The first business streets were built at the foot of these hills and run parallel to the shoreline. As the business section grew, the hills were washed into the bay by means of gigantic hydraulic operations. This work is still going on and the skyscrapers are fast covering

SEATTLE'S WATER FRONT, ALONG WHICH IT IS PROPOSED TO BUILD TWO BIG SEA WALLS.

these newly created areas of city real estate.

In the bay thousands of acres of land have been made available for factory sites, by the filling in of the tideflats.

But now another problem confronts the engineering department of the city. More water front must be provided for the city's increasing commerce with the Orient, Alaska and South America. The business section is established and cannot be moved backward from the bay to make room for more wharfage, so a new plan has been devised, the gigantic proportions of which will startle the engineering world.

City Engineer Reginald H. Thomson has proposed to the city council, the building of a great seawall at a cost of almost $20,000,000. It is proposed to construct this wall parallel with the present water front streets and two blocks distant in the bay. In addition the plan includes a dwarf seawall 1,280 feet further out running parallel with the main wall.

By filling in the space between the present water front and the main wall two level streets would be created and a large area suitable for warehouses and railroad tracks. The dwarf wall will be built to within forty-five feet of the surface of the water at low tide. This wall would be in the nature of a retaining wall and the space between it and the main wall would be filled and on this fill wharfs would be constructed. These piers would have a length of from 550 to 1,280 feet.

Reginald H. Thomson, City Engineer of Seattle.

By this arrangement the largest ocean liners would be able to dock without difficulty.

It is estimated it will take twenty years to complete this work. With this improvement, 200 acres of new commercial land would be created. This land would be worth $5 a square foot, making a gross valuation of about forty-five millions of dollars. Deducting the cost of the improvement, the net increase to the city would amount to twenty-five millions of dollars.

In addition to the value of the land, there would be the incalculable advantage

Skyscrapers Forcing Back Seattle's Hills.

and benefit accruing to the city by reason of the ample streets on a level grade, thus reducing the cost of transfer freighting along the water front.

The plan would add more than three and one-half miles of water frontage to the city's harbor, thus a water front now possible of being developed to a length of a little more than seven miles, would have a possible development of more than eleven miles.

hills, leveling streets, building sewers and controlling water courses, all for Seattle's sake.

Thomson is one of America's great engineers, and he has made his reputation and earned the right to the title by his work right in his own town. He has a salary of $7,500 a year, which is something of a joke when his work is considered and the fact known that he has refused three times that income from

BUSINESS SECTION OF SEATTLE CROWDING THE WATER FRONT.

In this connection it is worth noting that with Reginald H. Thomson back of this plan, it is extremely likely to be carried out. Thomson is the man who, for eighteen years has been breaking down railroad corporations, because the Seattle job is the darling of his heart. He's a fighter, from Indiana, and is a type of America's finest, the kind that works to accomplish—not merely to earn.

NEWEST GLOUCESTER FISHING VESSEL LEAVING PORT FOR MACKEREL FISHING.

DEEP SEA FISH CUT COST OF LIVING

By

RALPH BERGENGREN

AMONG all the articles of food eaten in this country the price of fish to the consumer has advanced less than any other during the last quarter of a century. So far it is almost the only permanent factor in the cost of living, nor does it show symptoms of any immediate increase or diminution. The statement might perhaps be disputed by those who buy fresh fish in the markets of the north Atlantic seaboard cities, but the price of fresh fish has always fluctuated with the supply obtainable on the particular day when the consumer wanted it, and has therefore little or nothing to do with general conditions. Price is here an arithmetical problem depending on the number of vessels unloading fish; the more vessels at the wharves the lower the price of fish at the fish market and the less money to be divided among the crews of the vessels. Fluctuating as it does even in the course of a few hours, the highest price of a fresh mackerel today is just about what it would have been twenty-five years ago—and so is the lowest.

The salt fish industry is a different matter in which the steadiness of price has almost the immovability of a salt fish when compared with a live one. It is this phase of the fisheries, represented by a yearly output from Gloucester, Massachusetts, of about forty million pounds of salt fish, to say nothing of something over ten million pounds of pickled, that has in the last quarter of

a century gradually included every state in the Union as a market for fish from Gloucester, a seaboard city of summer residents who flatter themselves it would be dead without them, and of a thriving old industry, now in process of modernization, whose peculiarity is that the deader the town looks the busier it is in reality. Fish are distributed from other places and a good sized fraction of the fresh fish caught by Gloucester vessels is landed at Boston, as the nearest large port to the fishing grounds. But the Gloucester fisheries are by far the most extensive in this country and Gloucester remains the one city that catches, prepares, and distributes a "harvest of the sea" ranging from Hatteras to Greenland, and totaling, for all varieties of fish, nearly ninety million pounds. When the streets of the town are empty it means that five thousand fishermen are practically all at sea catching fish. And when the fish landed at Boston are added to those landed at Gloucester the total yearly catch of these fishermen is about 124,725,000 pounds.

A Fish Skinner at Work.
Removing skins and backbone from 140 pounds of fish a day.

Because the catching of fish is a dangerous, picturesque, and heroic occupation the world at large has heard a great deal about the Gloucester fisherman and very little about the relation of his labors to the food supply of the nation or about the interesting and complicated business of getting countless big and little fishes out of very definite spots in the Atlantic and transporting them to countless big and little dinner tables all the way up and down and across the continent from ocean to ocean. Many a fine load of fish, to be sure, is caught in the Pacific, but from time immemorial enough to antedate Columbus the north Atlantic fishing grounds have been famous for the quality as well as quantity of their fish, and for this reason fish from Gloucester are today eaten in California and a Gloucester fish firm can keep tabs on its current business by sticking colored pins into a series of maps that cover the entire nation. With the exception of the breakfast food and motor car industries, it might fairly be said that this far reaching distribution of a salt water product is the newest American business development. Its entire growth beyond a narrow strip of seaboard has come about within the last half century, and the steadily increasing importance of salt fish as an item of diet in well-to-do families might be safely included within the last half of that period.

Less than twenty-five or thirty years ago the consumption of salt fish was practically confined to the poor. Outside of New England the majority of well-to-do Americans undoubtedly felt that if it required heroism to catch the fish before they were salted, it also required heroism, of a different kind, to eat them afterward. The ideal of flaky whiteness that compels the modern fisherman to split and salt a codfish almost the instant it is out of the water was at that period sufficiently realized by a rough and ready process that left the flesh brown and uninviting. Within these last twenty-five years, in short, all the modern meth-

ods of preparing fish for market in a convenient and appetizing fashion have been brought to their present standards, and during the same time the improvements in refrigeration have made it possible for the inhabitants of inland cities to obtain fresh fish with almost the same facility as those nearest the seaboard. This steady increase of territory, combined with the fact that the per capita consumption of fish is still a mere fraction of what the prophets think it will be, makes the fish business of today a lusty infant whose future growth will be very interesting to follow. Less than fifty years ago the sale of fish was restricted to the seaports and was conducted on the spot by the captain of a fishing vessel acting as supercago, and willing, if he could not sell for money, to exchange his salt fish for a return cargo of other commodities. Today the business goes forward to the ringing of telephone bells, the arrival of telegraphed orders, the click of typewriters handling an endless correspondence, and the constant search for wider markets that characterizes the most progressive type of organized business. Yet, on its deep water side, it remains, as it always has been, necessarily and satisfactorily a remarkable example of an almost communistic cooperation between the owners, crews, and captains of the fishing vessels.

MAKING A CODFISH ABSOLUTELY BONELESS.
Women remove all the small bones with pincers.

It is not the purpose of this article to describe the deep sea fishing that has been so often treated by other observers. Neither the picturesqueness nor the heroism have been exaggerated; nor so long as men put to sea after fish will these qualities be likely to diminish. The actual deep sea methods of catching fish have changed but little in the last half century and the modernization of the industry has simply multiplied and perfected them. The earliest fishing, when the blunt nosed Chebacco boats put out with their small crews of half a dozen men from Gloucester for the fishing grounds, was done almost entirely with the hook and line, and much of the cod-fishing of the present day is hand-line fishing either from the decks of staunch, yacht-like vessels lying at anchor on "Georges" or drifting with the tide across "The Rips," or by one or two fishermen in each of a dozen or more dories sent out from the vessel. The lines range from 1,000 to 1,500 feet in length with two hooks and a nine pound sinker and the fishermen are paid according to the number of fish that each man catches. Trawl fishing, a later development of the hook and line consisting of many hooks on a single line sunk horizontally in the water—so many that a single vessel may nowadays cover twenty miles of fishing ground with 30,000 hooks—was first practiced within the memory of men still living. The use of the seine and other nets in the mackerel fishery dates back to the early fisheries, but the seine has been lately improved by apparatus that makes it easier for the modern fisherman to handle these enormous bags when a school of mackerel has been surrounded and the seine is being "pursed" or brought together with the fish in the bottom.

As for the fishing fleet itself, it began nearly three centuries ago with one fifty ton vessel and now numbers 183 large vessels and about a hundred smaller ones, together with some eighty or ninety small boats, many of them run by gasoline engines, that fish near home and add materially to the picturesqueness of the harbor on their way to and from their daily occupation. An enumeration of the larger vessels shows the subdivisions of the fishing industry as it is now followed. Fifty-one are mackerel seiners, forty-seven go to the banks for cod caught with dory and trawl and after-

GLOUCESTER HARBOR, AS THE CENTER OF THE LARGEST AMERICAN FISHERIES LOOKS.

ward salted; twenty-three go out for fresh halibut; twenty-one for fresh fish in general—haddock, pollock, cod, mackerel, and swordfish; seven go hand-line fishing for cod on "Georges;" sixteen go hand-line fishing for cod on the "Rips;" six put to sea for halibut that is to be cured, sliced or "flitched" and smoked before it reached the consumer as Smoked Halibut; and the others for miscellaneous fishing according to the demands of the season.

These modern vessels—undoubtedly the finest sailing craft afloat for speed, steadiness, and carrying capacity—can be handled with safety in places that would have been fatal even to their immediate predecessors, and they are also managed, in this twentieth century, with perhaps a shade more of conservatism. It is safe to predict that the total loss of some 780 vessels and 5,300 seamen between 1830 and 1900 will not be repeated in the next corresponding period. Nor perhaps does the Gloucester skipper of today play with danger quite as recklessly as the skipper of twenty-five years ago, although he unquestionably takes all the risks, and some in addition, that the owners would find desirable. The line between business and foolhardiness is necessarily a narrow one, for the master of a fishing vessel, once he has put to sea, is equally responsible for the safe return of the vessel and for a full cargo of fish caught in the least possible time. He has a financial interest in the catch, his own reputation to maintain with the owners, and sometimes a quarter or half interest in the vessel. Time, with a fishing vessel, is money only when the crew is catching fish, and the distinction between a legitimate and an illegitimate risk in the run to and from the fishing grounds is therefore one that demands an unusual degree of quick and sound judgment. It is the quality of mind that characterizes the locomotive engineer with the difference that the engineer is running according to a time table while the skipper is making his own schedule.

Gloucester fishermen, when the idea has been suggested to them, have never been interested in the notion of working for wages. They prefer the ancient system of a division of profits. The fishing firms of Gloucester own the fishing fleet, but instead of hiring men to work it the firms practically put in the vessels and the men put in their time. The firm selects the skipper and the skipper selects the crew. In the final settling up of a Georges hand-line codfishing trip, for example, the fish are sold to the highest bidder or else purchased by the owners of the vessel, who are also the fish packers and distributors, at the market price when the catch is landed. From the gross stock is subtracted the cost of bait, ice, towing, license fees, and other necessary expenses. The remainder is divided into halves. The owners of the vessel take one-half for the use of their property and pay the captain a certain percentage for taking care of it during the voyage. The other half, minus some small incidental expenses that are borne by the crew, is divided among the fish-

ermen according to the number of fish caught by each individual. This account is kept by the captain, who, in addition to his percentage from the half credited to the owners, receives an average share from the half divided among the crew. The cook also gets an average share as payment for his services in the forecastle and is paid in addition for whatever fish he is able to catch when not attending to his regular duties. What this means in money varies with the conditions of different voyages. A fairly typical example would be a six weeks' trip of a vessel carrying sixteen men in addition to the captain and cook and earning an average net share of $64. This is exclusive of the living of the men during the trip and shows that the wage of a fisherman compares favorably, but by no means remarkably, with that of other callings. Short voyages for fresh fish, "lucky" in finding the fish and again "lucky" in making port ahead of competitors, often clear up much larger sums of money and almost any voyage stands the chance of making a record. Thus it is hardly to be wondered at that the typical fisherman prefers the "gambling chance" of four or five dollars a day on the divided profits of an exceptional trip to the certainty of smaller wages.

However up-to-date the office, it will thus be seen that the skipper of a fishing vessel is still the dominant figure of the industry in its salt water aspect. In whatever pertains to catching the hundred and twenty-four million odd pounds of fish annually taken by the fleet the influence of the skipper is the vital factor. Invariably he has been a fisherman first and a captain afterward and he grows naturally into a disciplinarian who can chum with his crew and at the same time command its respect and implicit obedience; a navigator who has "learned by doing," and knows the fishing grounds as the city gamin knows his own neighborhood; and, more than that, a man of business in a rough and ready way, both in managing the finances of his trip and in disposing of its product. Every skipper who sails out of Gloucester has opportunities to graft on the owners of the vessel and the cases when such a thing has happened are so rare that they merely serve to prove the rule that the Gloucester skipper is a man of unquestionable integrity—a well deserved reputation that began in the days when salt fish were disposed of at various seaports and the captain of the vessel acted also as supercargo. And this condition also is still visible in the fact that a skipper coming into port with a trip of fish is at liberty to bargain with several firms in

A FLAKE YARD AT THE WHARF LEVEL.
In these yards millions of fish lie drying in the sun and wind.

order to get the highest price for it. Upon his personality depends the chances of success in every fishing venture even before the beginning. A skipper whose ability to get the fish is known to be of the highest order easily enrolls a picked crew and his chances of making good are increased in proportion. A skipper known to be less likely to get the fish must be contented with second choice among the available seamen. And a skipper whose "luck" continues bad for several trips in succession is in a fair way to find himself without a vessel because he cannot enlist a crew to man it.

And yet, despite larger vessels, more men, more fish, and more consumers, the total weight of salt fish today sent out from Gloucester for general consumption is perhaps less than it was twenty-five years ago. The explanation of this seeming contradiction lies in the evolution of the business from the sale of the whole fish roughly salted to the sale of the boneless fish in the small, neat packages with which we are all becoming more and more familiar. The weight of salt fish that now goes out is all food, as much so as the most determined of breakfast cereals; while that which went out in the earlier period was food plus skins, bones, heads, and tails—a by-product whose modern utilization for glue and fertilizer has acted to keep down the price of salt fish to the consumer when the increased cost of preparation would otherwise have inevitably raised it. Skins, bones, etc., are now worth dollars a ton where twenty-five years ago they were worth pennies, and only a little earlier nothing whatever. The only salt fish then obtainable were those that hung by their tails in the back part of the grocery shop, and, although boneless salt fish were first prepared in the late 60s, it required some twenty years or more before the appreciation of a new public began to be visible in the steady consumption of the new product. From that point the development has steadily built up the packing houses that now line the shores of the harbor and employ a host of workers that has brought the estimated total population supported by the fisheries to something over fifteen thousand.

A Flake Yard in the Air.
The roof of a fish packing establishment makes a fine place to dry fish.

In these packing houses the fish business passes from the romance of deep sea ventures and the communism of shared profits to the method and system of organized industry. Cleanliness, beginning from the first thorough washing of the fish before they are given their first salting on shipboard, is the most striking characteristic of the preparation of this deep sea product for the modern consumer. It is best typified by the "flake yards" on the roofs of the packers' buildings where millions of fish lie drying in the sun and wind, protected from the direct rays of the sun and from any chance dust that the wind might bring with it, by what, all told, would amount to several acres of snowy canvas coverings. The fish under these coverings are well on their way to the dinner table although they still carry their bones with them. The first step came immediately after they were taken out of the water when they were split open, cleaned, thoroughly washed, and packed in the hold in pure sea salt. From the vessel they have been unloaded on the wharf at Gloucester, again thoroughly washed, salted, and packed away in great hogsheads to await the next step in the process. Each butt, or hogshead, holds 1,200 pounds of fish and the shed suggests an enormous wine cellar except that you pick your way among the butts over a floor slippery with salt and water, and the cool dusk of the shed emphasizes the blue surface of the harbor as you see it through distant doors like a framed picture. Each hogshead bears a record of the vessel

and contents, this record being duplicated in the counting house of the company.

Before the fish are taken to the flake yards for the sun and wind drying—a process which requires professional judgment and may take days or hours according to atmospheric conditions—they are removed from the butts, again thoroughly washed, and piled, fish on fish, until the accumulated weight presses out the pickle. Then they are wheeled in barrows over a moving stairway that carries them to the upper level of the flake yards, and from the flake yards they descend in elevators to the dry fish house and the skillful knives and fingers of the skinners and pickers.

In a Butt Shed.
Each butt holds twelve hundred pounds of fish salted with sea salt.

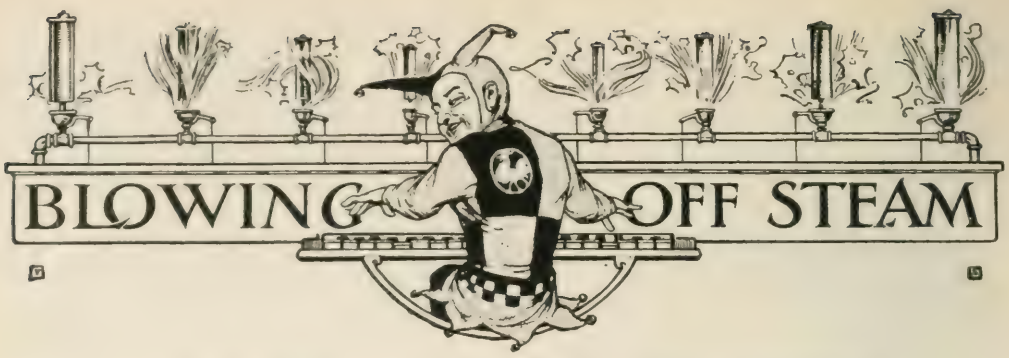
A properly sun cured hand-line codfish, caught on "Georges" in the good old summer time when food is plenty and codfish fat and lazy in consequence, is the finest type of salt fish that has yet been creamed for an epicure's breakfast. It is not only almost as white as the canvas under which it has been dried by the sun and wind, but the skin comes off easily under the deft hands of the skinner; a quick movement of the sharp knife, a sudden pull of the skin, and the fish is divided into food and by-product. The by-product is on its way to mend china or improve farms and gardens and the food part of it, minus backbone as well as skin, goes to the female operatives whose task is patiently to remove all the smaller bones with pincers. Then the boneless fish is ready to be cut into lengths for the boxes, or it proceeds further through the teeth of revolving wheels that tear it to pieces and make the kind of fish that is not only boneless but shredded. Then, as the Advertising Man puts it in his simple way:

"The brace, the food value of this tender fish—we cannot describe.

"Why should we?

"One juicy, savory mouthful tells the whole story—and you'll believe it."

Such is the treatment of the cod, and cod is the staple and backbone of the modern salt fish industry as it was even in the earliest days of the fisheries. Difference in treatment makes it practically a new product and this could be said also of the other items that round out the industry. The halibut fishery is a large item, but here the problem is to produce not a white fish but a rich red brown temptation to a fish loving appetite. The halibut voyage is longer for the fish are captured in the cold waters coming out of Baffin's Bay and have already been salted aboard ship and cut into slices before they are handed over to the packers. Gloucester takes them to the smoke houses where all winter a continuous smoke rises from smouldering oak chips and sawdust and in this smoke countless halibut slowly take on the characteristic color that is known to buyers of smoked halibut from one end of the country to the other. Mackerel also are split, cleaned, and washed in several waters and salted aboard the vessel, a proceeding repeated in Gloucester before the pickeled mackerel are finally headed up in the barrels in which they are distributed. Fresh fish, on the other hand, are brought in on ice and the voyage is limited to the shortest possible time and the quickest possible market—a combination of circumstances which makes it possible for fresh fish to vary so surprisingly in price within the space of a few hours. Mackerel, for that matter, are the unstable quantity in an industry in which the supply is otherwise fairly easy for the experts to predict from season to season. Once numerous in local waters, it has been necessary during the last half century to go in search of them, and at the game of hide and seek the mackerel have established a canny reputation and are even now cheerfully defying the United States Government to locate them with any very comfortable degree of certainty.



In Gay Paree

HODD—"Can you conceive of any situation where you would want to be separated from your wife?"

TODD—"Yes in Paris."—*Town and Country.*

Shameful

EXTRACT from a young lady's letter from Venice: "Last night I lay in a gondola in the Grand Canal, drinking it all in, and life never seemed so full before."—*Lippincott's.*

A Substitute

PROSECUTING ATTORNEY—"Your Honor, the bull pup has gone and chawed up the court Bible."

JUDGE—"Well, make the witness kiss the bull pup, then. We can't adjourn court for a week just to hunt up a new Bible."

Defined

IKEY—"Fader, what's 'superfluous'?"

FATHER—"Wearing a necktie ven you've got a beard, Ikey."—*Life.*

Tried It

"NO MAN can serve two masters," said the priest to one of his parishioners.

"I know that, yer Riverence. Me brother tried it, and now he's doing time for bigamy."

Student Logic

1911—"The say that rye is the only thing to cure tonsilitis."

1910—"Where can you get it?"

1911—"What, the rye?"

1910—"No, the tonsilitis."—*Harvard Lampoon.*

Usual Interpretation

STELLA—"What is the law of heredity?"

BELLA—"That all undesirable traits come from the other parent."—*New York Sun.*

Chance for Cuspidors

AT a meeting of the lodge in a 'wayback village a member suggested that cuspidors be secured.

"I move, Mr. President," said an ever-ready member, "that the executive committee be empowered to employ two competent cuspidors to serve during the ensuing year."—*—Everybody's.*

Too True

"YOU certainly have a trim little waist,"
I said as she put on her hat.
But she turned me aside and quickly replied,
"You're right—there's no getting 'round that."—*Tiger.*

The Pets

HE—"It's quite true that there are microbes in kisses."

SHE—"Oh, the sweet little darlings!"—*Illustrated Bits.*

Standard of Quality

MRS. JONES and her neighbor, Mrs. White, were talking over the back yard fence and neither of them could solve the identity of the new neighbors who had just moved in.

Presently they saw the garbage man approaching and knowing him to be an unfailing source of information asked, "Jake, who are the new people who have just moved in?" "I don't know, mum," replied Jake, "but they have the swellest swill in the block."—*Chicago Tribune.*

The Witching Hour

CLAIRE—"Jack told me he wanted to see you the worst possible way."

ETHYL—"And what did you say?"

CLAIRE—"I told him to come to breakfast some morning."—*Brooklyn Life.*

In Memorium

TWO JEWS stopped on the street to talk to each other, one wearing a large diamond tie pin.

"Solomon," said one, "that is a fine diamond you have. Where did you get it?"

Solomon—"Well, my brother Ike died and left $250 for a stone. This is the stone."—*National Food Magazine.*

Financial Difficulties

"MARSE Geo'ge, he come to me last fall an' he say, 'Eli, dis gwine ter be a hard winter, so yo' be keerful, an' save yo' wages fas' an' tight.'

"An' I b'lieve Marse Geo'ge, yas, sah, I b'lieve him, an' I save an' I save, an' when de winter come it ain't got no hardship, an' dere was I wid all dat money jes' frown on mah hands!"—*The Youth's Companion.*

Connubial Bliss

MRS. QUACKENBOSS—"Am yo' daugtah happily mar'd, Sistah Sagg?"

MRS. SAGG—"She sho' is! Bless goodness, she's done got a husband dat's skeered to death of her!"—*Woman's Home Companion.*

Up Against It

MRS. JONINGS—"It's raining, John, and Mrs. Smithkins wants to go home. I have no umbrella to lend her except my new $10 one. Can't I let her have yours?"

JONINGS—"I should say not! Why, the only umbrella I've got has her husband's name on the handle."—*Chicago News.*

Hands Up!

ELEANOR, aged six, had been going to school only a few weeks. She had learned to raise her hand if she wanted anything. One day she put this into effect when she was sent to the chicken-house to get the eggs.

Just as she reached the chicken-house door her mother heard her say, "All you chickens that have laid an egg, raise your hands."—*The Delineator.*

Public Baths

MOTHERLY HOSTESS—"Our modest establishment has only one bathroom, so we all have to arrange when to take our turn. What time would you like to have your bath?"

NERVOUS YOUTH (who means well)—"Oh, *your* time is *mine*, Mrs. Brown."—*Punch.*

Omniscience

FOUR-YEAR-OLD Harry was spending the day with his aunt. Dinner was late, and the child began to grow restless.

"Aunty," he said finally, "does God know everything?"

"Yes, dear," answered his aunt.

"Every little thing?" he persisted.

"Yes, every little thing," was the reply.

"Well, then," he said in a tone of conviction, "God knows I'm hungry."—*Today's Magazine.*

Human

THE young man, leading a dog by a string, lounged up to the ticket-office of a railway-station and inquired:

"Must I—aw—take a ticket for a puppy?"

"No; you can travel as an ordinary passenger," was the reply.—*Universalist Leader.*

His Favorite Play,

"WHAT is your favorite play?" asked the girl who quotes Shakespeare.

"Well," said the youth with long hair. "I believe I like to see a man steal second as well as anything."—*Washington Star.*

A Wise Precaution

THE day before she was to be married the old negro servant came to her mistress and entrusted her savings in her keeping. "Why should I keep it; I thought you were going to

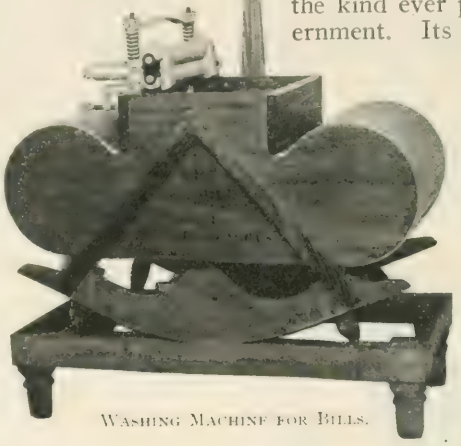
get married?" said her mistress. "So I is, Missus, but do you 'spose I'd keep all dis money in the house wid that strange nigger?"—*Success.*

TO WASH OUR CURRENCY

By

FRANK N. BAUSKETT

ALL the soiled and germ-laden government notes and greenbacks are to have a cleansing and sanitary bath. More than $200,000,000 of tainted greenbacks were withdrawn from circulation and destroyed by the Federal government last year, and they had to be replaced by new notes which cost a vast sum to manufacture. Had it been discovered that money could so easily be washed approximately $200,000 a year would have been saved. That is the amount the director of the Bureau of Engraving and Printing has figured on curtailing from the expense of running the bureau by laundering all of the soiled money and putting it back into circulation rather than replacing it with new notes. In other words, under the new scheme a greenback will last at least twice as long.



WASHING MACHINE FOR BILLS.

The inventor of the machine for washing money, Mr. F. B. Churchill, after satisfying himself that money could be washed, "starched" and ironed, and be as fit as a new-laundered shirt, took his machine to the capital and demonstrated to the authorities the scheme whereby they could put another spoke in the wheel of economy. Mr. Churchill took from his pocket a badly soiled ten-dollar bill and threw it into the swishing-swoshing water inside the machine. In less than a minute he removed the note from the apparatus, sent it through the rubber wringer and tossed it on the window-sill to dry in the sun. It was soon dried and appeared as a brand-new bill.

So pleased were the officials of the government's money factory that they at once bought the machine and it is now doing its good work in the bureau. It is the first machine of the kind ever purchased by the government. Its cost was but a trifle compared with what it will actually save in the manufacture of new money. Indeed there is some thought of establishing at the bureau now a division of money cleaning.

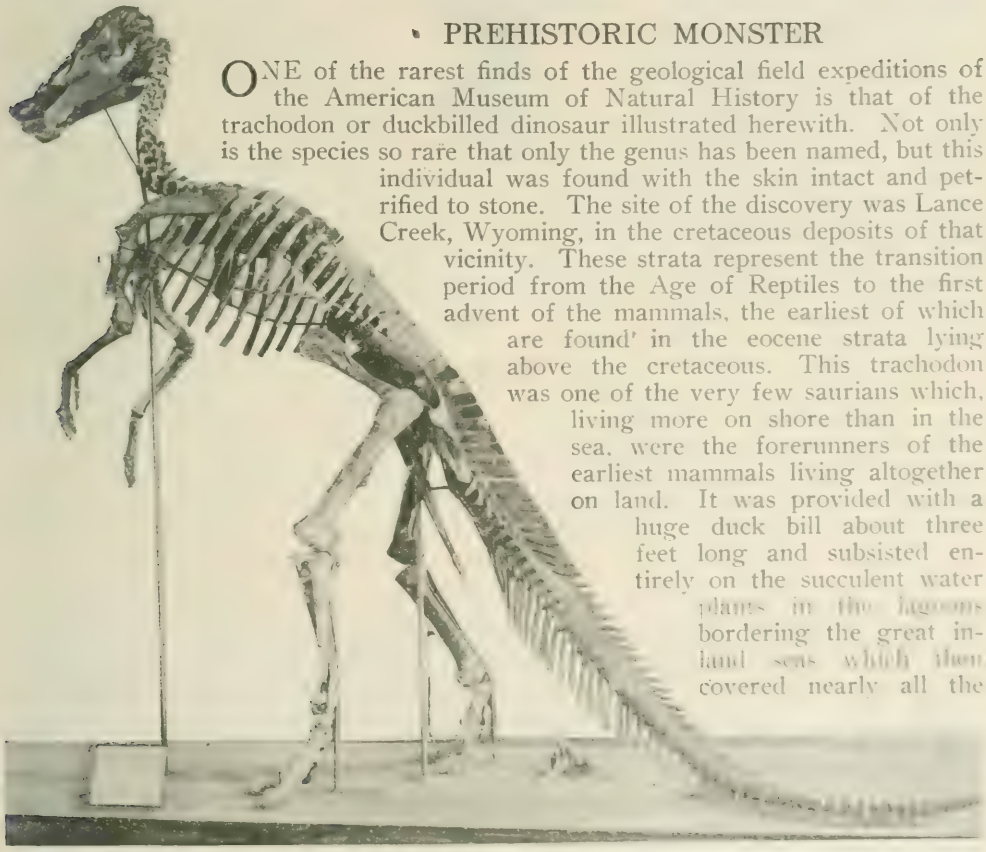
The apparatus is similar to an ordinary clothes-washing machine, and is made of hard wood. It has an upright handle above the central oblong oscillating vessel, with air-chambers at each end. In the central vessel is placed warm soaped water, and the money is placed therein. Then the handle is worked back and forth. The air in the chambers is compressed by the contents of the vessel, thereby forcing the water through the money by pneumatic pressure. The director of the bureau contemplates putting the washed money through a "starching" process before it is placed into circulation again, making it as crisp and clean as when it was originally put out.

This not only means that the people will have cleaner money to handle, but, it is claimed, will greatly reduce the chance spread of disease by the circulation of germ-laden currency, concerning which there has been so much said lately.

POPULAR · SCIENCE & MECHANICS SUPPLEMENT

PREHISTORIC MONSTER

ONE of the rarest finds of the geological field expeditions of the American Museum of Natural History is that of the trachodon or duckbilled dinosaur illustrated herewith. Not only is the species so rare that only the genus has been named, but this individual was found with the skin intact and petrified to stone. The site of the discovery was Lance Creek, Wyoming, in the cretaceous deposits of that vicinity. These strata represent the transition period from the Age of Reptiles to the first advent of the mammals, the earliest of which are found in the eocene strata lying above the cretaceous. This trachodon was one of the very few saurians which, living more on shore than in the sea, were the forerunners of the earliest mammals living altogether on land. It was provided with a huge duck bill about three feet long and subsisted entirely on the succulent water plants in the lagoons bordering the great inland seas which then covered nearly all the



A DUCK-BILLED DINOSAUR.

Its great size is evidenced by the small reconstruction, which shows its proportions as compared with those of the average man.

world's present continents. As a general rule, nearly all the large dinosaurs were dismembered and stripped of their flesh after death by the large turtles and crocodiles which were always on the lookout for such prizes, but the individual illustrated is remarkable in escaping with the skin untouched. It is shriveled into sharp-ridged folds, showing gradual drying out and mummifying under the action of the sun, and the skin is mottled and leathery, entirely unlike the scales of such reptiles as alligators, etc. The trachodon was found lying curled up on its side on a sandbar of the cretaceous, and the evidence of the surrounding rocks and the condition of the skin is, that the creature, after a prolonged period of scorching sun-baking which prevented decay, was suddenly buried in the silt of a freshet which protected it from further interference and allowed the slow process of petrification to take place. It is now on exhibition at the museum, with a small restoration showing its proportions compared to man, as will be perceived from the illustration.

Popular Dress for Air Women.

CHESS BY CABLE

THE accompanying illustration shows —on the left—Mr. J. H. Blackburne, the well known chess player, just after a move in the cable chess match, which was played recently between England and America. The picture was taken in the Savoy Hotel, London, whence the British representatives cabled their moves to Brooklyn. One who was present writes that in the last stage the British players put forth strenuous efforts to win, and in doing so some of them sailed very close to the wind, causing anxiety to the multitudes of onlookers, who always profess to see more of the game than the players.

LATEST SYLES IN AVIATION DRESS

IT was to be supposed that directly women learned to master the intricacies of the flying machine they would at once design a new dress—and this they have done as is shown in our photo. The suit is made of leather with breeches of a thick tweed; gaiters and boots complete the ladies' extremities while a close fitting fur cap and gauntlet gloves completes the whole costume.

AUTOMATIC FLAGMAN

AN automatic flagman that will swing a red light, wave a red flag, ring a bell, and illuminate a crossing has just been tried out with success on an interurban trolley system in California. The deaf, the blind and the careless will receive ample warning when crossing car tracks whether by day or by night by this device which never forgets and never goes to sleep at its post.

The English Chess Team.

Flagman That Never Sleeps

A statement given out by the inventor, Mr. A. C. Hunt, an electrical engineer of Los Angeles, gives the following details: "The device consists of a pole equipped with a bell, two white lights, one red light, a red board bearing in white letters the words, 'Look Out,' which swings in an iron groove, and two rails along the track fifteen hundred feet on each side of the signal pole, with a wire communicating with the signal pole."

"When a car approaching from either direction crosses this rail by day, the bell rings and the flag swings out, giving automobiles, carriages, or foot passengers visible and audible warning of the car's approach, and affording the motorman ample oportunity to stop his car in case of need."

"At night the flag swings, the bell rings, a red light shows in the center of the 'Look Out' signal and two white lights illuminate the crossing, not only enabling approaching travelers to see the track many feet in either direction, but making it possible for the motorman to plainly see waiting passengers who will thus escape the annoyance of being left to wait for another car."

"The device has been in actual operation for the past two months at Abila Station on the Long Beach line of the Pacific Electric Railway and has demonstrated its value as a life saver and preventative of accidents to such effect that it has been decided by the company to install several hundred automatic flagmen on the Pacific Electric lines."

DIVER MADE OF SPONGES.

AUTO AS A TRACTOR

A NEW use for the automobile has been discovered by a progressive western farmer, who transports his heavy machinery, such as traction engines and threshing machines, by hitching the auto to them. The automobile is coming to play an important part in the work of the farmer, as devices have been perfected for using the automobile motor for such varied work as sawing wood, operating a churn and pumping water. It is reported by automobile agencies that more machines are being sold to farmers in Kansas than to city men in New York.

FIRST LIGHT-HOUSE FOR AIRSHIPS

NUMEROUS plans have been proposed for a systematic network of airship signal stations over the German Empire. While no one system has yet received official or professional sanction, an initial step in this important matter has already been taken at the town of Spandau in Prussia, where an aerial lighthouse is now in full operation. The experiments of the German war office with aerial craft are largely conducted near Spandau and nocturnal flights are increasingly frequent.

AUTOMOBILE TRANSPORTS HEAVY MACHINERY

The "Works" of a Doll.

This first beacon for aerial craft is comparatively simple in its construction. It consists of an elevated support on which is a horizontal wooden ring in which thirty-eight powerful incandescent electric lights are placed at equal distances about the circumference. The location of Spandau is thus clearly indicated to an airship passing over the place, by a large, luminous circle, alternately disappearing and reappearing.

In the United States the question of aerial lighthouses is being taken up and Cleveland is planning for the erection of a signal of this type for American airships.

Steeple of Church Blown Off by Dynamite.

THE ANDREIDES; AUTOMATONS

ABOUT a century and a half ago the ingenious watchmakers of La Chaux de Fonds, created many wonderful human automatons, one of which is shown in the picture. These dolls have passed through many hands since that time, and in the nineteenth century they were sold to the Neuchatel Museum by the collector, Karl Marfels. The female figure performs skillfully on the harmonium, while two male figures can write and draw.

RABBIT DRIVE

CERTAIN parts of the West, which are greatly overrun by jackrabbits, indulge in annual hunting expeditions known as "rabbit drives." The accompanying picture shows about one-fifth of the number of rabbits killed in one day's drive. The rabbits are destructive to growing crops and undoubtedly cause heavy financial loss.

BENZOL FOR AUTOMOBILES

IN Europe benzol is being more and more extensively used in place of gasoline for driving automobile engines. Benzol is an impure benzine, a product

AT THE END OF THE "DRIVE."
One-fifth of a day's rabbit hunt.

of coal distillation. It is now used chiefly in enriching of illuminating gas, for mixture with alcohol in alcohol engines, and in the india-rubber industry.

The greater part of benzol is a by-product of the manufacture of coke, and the production may easily be doubled or trebled if the demand increases. Its volatility and composition being somewhat different from those of gasoline and denatured alcohol, motors in which it is used require adjustment, but hardly more than is necessary in passing from one grade of gasoline to another.

PORTABLE FEED TROUGH.

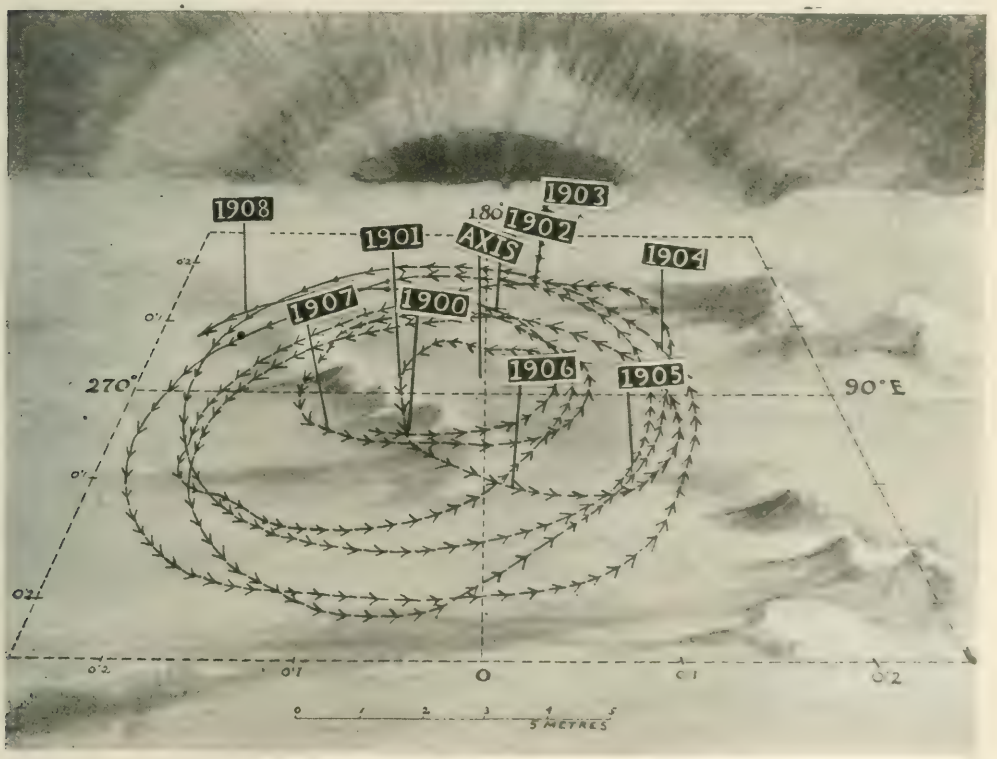
PORTABLE FEED RACK

THIS style of feed rack will accommodate thirty horses, the mangers extending around the base of the wagon bed and the hayrack extending down the middle. It is used in construction camps in the west, where large numbers of horses are fed in this way without the loss occasioned by feeding from nose bags or placing the hay on the ground.

NORTH POLE A WANDERER

DR. COOK, or any other explorer, will have a chance to discover the North Pole for the first time next year, for it will not be where it is this year or was last.

There is a yearly elliptical movement and a circular movement in a period of 428 days. The accompanying illustration shows the movement of the pole and its position for various years. It is obviously impossible for any explorer to set up a staff that will lengthen the axis of the world for all time.

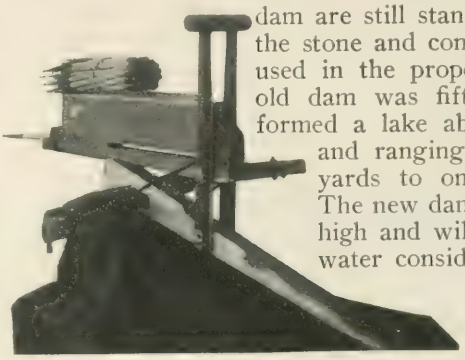


THE MOVEMENTS OF THE NORTH POLE

NEW HIGHWAY FROM NEW ORLEANS TO SAN ANTONIO.

PROPOSED SOUTHERN HIGHWAY

THE construction of a continuous highway between New Orleans and San Antonio, approximately six hundred miles, is being actively promoted by the people of the towns and communities along the proposed route. The project is said to be already well advanced, many of the parishes of Louisiana and counties of Texas having voted bonds for the construction of links in the road. In places but little work will have to be done, as the road improvements are of a high standard. It is planned that that portion of the highway between New Orleans and Houston, 353 miles, shall be constructed of shells, and the division between Houston and San Antonio will be macadamized with crushed stone. When finished this highway will be an ideal route for automobiles, it is claimed.



PHILIPPINE ARROW GUN.
This machine hurls bamboo arrows several hundred yards. The arrow tips are coated with a deadly poison.

BIG DAM TO BE REBUILT

THE contract has been let for the reconstruction of the great dam across the Colorado river at Austin, Texas, which was destroyed by a flood in that stream in 1900. The ruins of the old dam are still standing, and a portion of the stone and concrete structure will be used in the proposed new work. The old dam was fifty-four feet high and formed a lake about thirty miles long, and ranging from a few hundred yards to one-half mile in width. The new dam will be sixty-five feet high and will thus form a body of water considerably larger than the original lake. The price to be paid for reconstructing the dam is $1,000,000.

It is a municipal project, and the power that is to be derived from the big reservoir of water will be used to operate a hydro-electric plant and waterworks. The new dam will be made of reinforced concrete.

DAM ACROSS COLORADO RIVER WRECKED BY FLOOD.

AUTOMOBILE KITCHEN TRAIN BUILT FOR THE EMPEROR OF GERMANY

BALLOON EXPLODING IN MID-AIR

THIS is a photograph of a balloon taken at Long Beach, California, March 20th, 1910, just at the time it exploded, 400 feet in the air. Aeronaut Eugene Savage can be seen on his trapeze. He succeeded in getting his parachute open, but the big balloon suddenly collapsed, and shot downward, striking the parachute a moment after the big umbrella had opened, causing it to close, and carrying the human freight swiftly toward the earth. When about fifty feet from the ground the parachute partly opened again, saving Savage from being dashed to death, and while badly bruised, no bones were broken.

BALLOON EXPLODES.

KAISER'S KITCHEN TRAIN

ONE of the latest marvels achieved by automobile industry is the automobile kitchen train constructed for the German Emperor as a substitute for his horse-drawn field kitchen. This train comprises two cars, each of them having a Mercedes chassis with a 45 h. p. motor. One is the kitchen automobile proper, and the other a bus

A CLASS IN NATURAL HISTORY.
School children studying a stuffed hippopotamus in a museum.

Mirror Shows How We Will Look in the Picture.

for carrying the cooks, helpers, and waiters.

The kitchen car resembles in its outward appearance a closed bus or mail van, its interior being lighted by large sliding windows in the front and back walls. Part of the kitchen equipment is stowed away under the water-tight sailcloth coating of the roof. An adjustable tent roof can be lowered from both sides of the car to protect the men in case of bad weather. The kitchen utensils are arranged so ingeniously as to take up only little room. In the front wall of the car is located the alcohol heated kitchen stove, and a hot-water tank. A number of boxes and ice tanks are provided for meat, butter, wine, and other supplies, and in two cabinets to the right and left, are neatly arranged silver forks, knives and plates for twelve persons, so that the standard of the imperial table may be upheld even in the field. A hinging wash-stand fitted below the driver's seat is another welcome addition.

In the same car is transported a large folding tent for twelve persons which can be put up readily within a few minutes on any ground. In its center is installed an oval-shaped table that can be folded up in four parts, and round this, twelve folding wooden chairs which are partly stowed in the double walls of the car.

The motor bus accommodates eight to ten persons in addition to the two installed on the driver's seat. The benches installed in the interior of the car can be removed and used for sitting in the open, as well as for putting up a complete folding bed in the car so that the Kaiser may even spend the night in the field.

TO SEE OURSELVES AS THE CAMERA SEES US

THE newest fixture for the photographic studio makes it possible that the person who is to be photographed can see himself just as he will appear in the finished picture. It consists of a full length plate glass in front of the camera and which reflects the image of the subject to him. The subject can thus choose the pose desired with much better results than otherwise.

The mirror does away to a great extent with the unnatural, affected poses which are one of the sources of greatest annoyance to professional photographers.

The Nine-Foot Polar Bear From Nova Zembla. He enjoys a lunch in the water.

Work of a Sand Artist.

SAND SCULPTURE

"MADONNA of the Beach," is the title of an artistic piece of sand sculpture that was executed several days ago by an itinerant artist who drifted onto the beach at Venice of America, California, fashioned the realistic study, and disappeared without revealing his identity. The figures were lifelike, and clothed with a filmy drapery of sand that fell about them as a soft veil. The picture endured but an hour, for the encroaching tide covered the forms and erased them entirely.

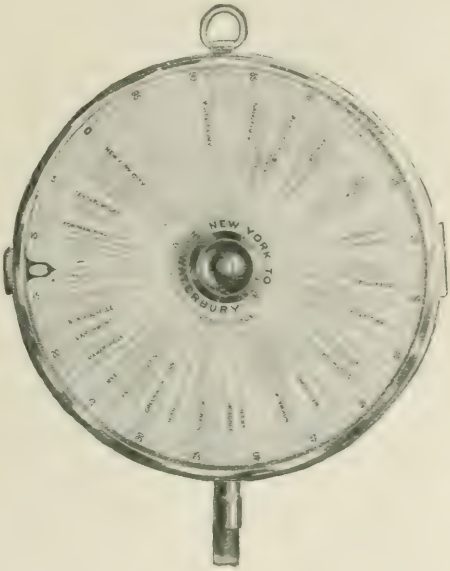
MODEL AEROPLANES

COMPARATIVELY few of those interested in air craft are able either to buy or build full-sized machines. Most of them turn to small scale models as the best substitute. Hundreds of men and boys are building and experimenting with models of their favorite type of "plane" and their numbers are increasing by leaps and bounds.

In France, where interest in things aeronautic is highest, the officials have been forced to bar model aeroplanes from the public parks, as the multitude of these irresponsible little flyers became distinctly dangerous.

THREE FOOT MODEL OF THE WRIGHT AEROPLANE.

The accompanying illustration shows a three-foot model of the Wright aeroplane recently built by two Chicago young men. It flies over two hundred feet and can be made to go up or down in straight lines or circles according to the set of the rudder. A rubber motor is used which is wound up by a crank and released by a trigger. It is provided with two propellers and starts from the hand.



THE "LIVE MAP."

A LIVE MAP

TO be able to sit in your automobile and have every hole in the road pointed out to you several minutes before you reach it by a finger upon a dial, is the result obtained by one of the latest marketed appliances for the edification of the motor enthusiast. If it proves to be as practical as it is ingenious, it should add much pleasure to motoring and may at times be the means of preventing serious accidents.

The dial shown represents a road map from New York to Waterbury, giving a full description of the road from Columbus Circle in the Metropolis to the Elton Hotel in the last named city.

Every turn is carefully indicated, every railroad crossing, every bridge, and even in some places the side of the road best suited for motor travel.

This paper dial is placed within a brass

AUTO CARRIES MAP WHICH CONSTANTLY KEEPS PASSENGERS INFORMED OF ROAD.

case and is revolved by means of a connection through a long flexible shaft from the axle of one of the front wheels. An index finger points to the direction upon the dial and at the same time indicates the number of miles traveled and the number yet to go.

DRUG STORES IN PATROL BOXES

HEREAFTER when a man is knocked down by a street car in Los Angeles, the policeman who rings up the ambulance will find ready to hand in the patrol box, an assortment of surgical instruments, gauze and rubber bandages so that immediate attention may be given the victim before the ambulance arrives. In addition to this, antidotes for various poisons with instructions for their use will be placed in the patrol box medicine case, so that when suicide has been attempted or poison taken by mistake the proper treatment may be applied at once. A few days ago Police Surgeon Zerfing equipped a patrol box with this outfit by way of an experiment and it is expected that every police telephone box in the city of Los Angeles will become a miniature drug store.

Chief of Police Galloway, who came into office on the "Reform Wave," is said to have recommended this novel life-saving device to the city council.

METAL VAPOR GIVEN OFF BY SUN.
The size of the earth as compared with the clouds of vapor is shown in the upper right-hand corner.

ODD FOUNTAIN IN MUNICH.
Faun squirts water on boy's head.

A SOLAR CYCLONE.
Metallic vapor given off by the sun.

CHILD'S AEROPLANE ACTUALLY FLIES

THE four-year-old daughter of Louis Paulhan, inventor and aeronaut, is following in her father's footsteps. Mr. Paulhan has made for her an aeroplane which

can be pushed along the lawn till it acquires speed, and the little girl goes skimming along over the grass a few feet from the ground for a short distance and then settles gently to the earth. Miss Paulhan is probably the youngest follower of Darius Green, but the flying plane which she uses is more scientific than was that of Darius. It satisfies her that she is really flying—and incidentally may set the example for a new craze in children's toys.

THE INSIDE WHEELS OF AN AUTO LEAVE THE GROUND ON A TURN.

WHICH WHEELS OF AUTO LEAVE THE GROUND?

MANY motorists are somewhat in doubt as to which wheels of an automobile leave the ground in making a fast turn. The accompanying photograph clearly shows the inside wheels off the ground as the car is coming from the extreme right, making a left-hand turn. At the left is shown the high embankment of the turn. It will be seen in the illustration that the tendency of the speeding motor car was to follow its former direction from right to left in the picture, and when the car tipped, it continued to follow the earlier direction, the inside wheels leaving the ground. It may be stated that the same holds true under all circumstances, the car always following its earlier motion in tipping so that the inside wheels rise off the ground in every instance.

RADIUM COLLECTOR.

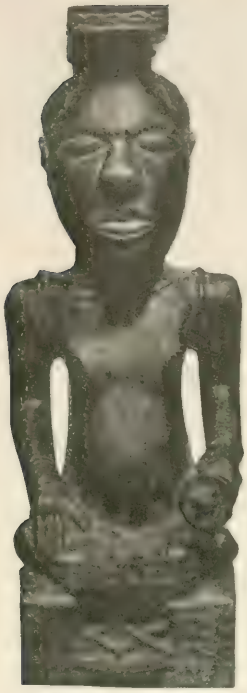
RADIUM COLLECTS ELECTRICITY FROM THE AIR

ONE of the strangest uses to which radium has yet been applied is for collecting electricity from the air. The method has recently been developed by an eminent English scientist.

The apparatus consists of a metal spiral, coated with insoluble salts of radium suspended in the air. From the spiral a wire leads to an electroscope, the other side of which is grounded. The electroscope is an instrument which shows when electric discharges are passing through it.

When set up the radium ionizes the atmosphere, and the aerial wire becomes charged until its potential is that of the atmosphere at the collector. This is effected in a second or so, and when it is connected to the electroscope there is an automatic discharge at frequent intervals. The frequency of these discharges naturally varies according to the electrical state of the atmosphere. At times it will be slow and infrequent, but at others the automatic discharges take place in very rapid succession.

APPARATUS FOR COLLECTING ELECTRICITY FROM ATMOSPHERE.



NATIVE STATUE OF KING OF THE CONGO.

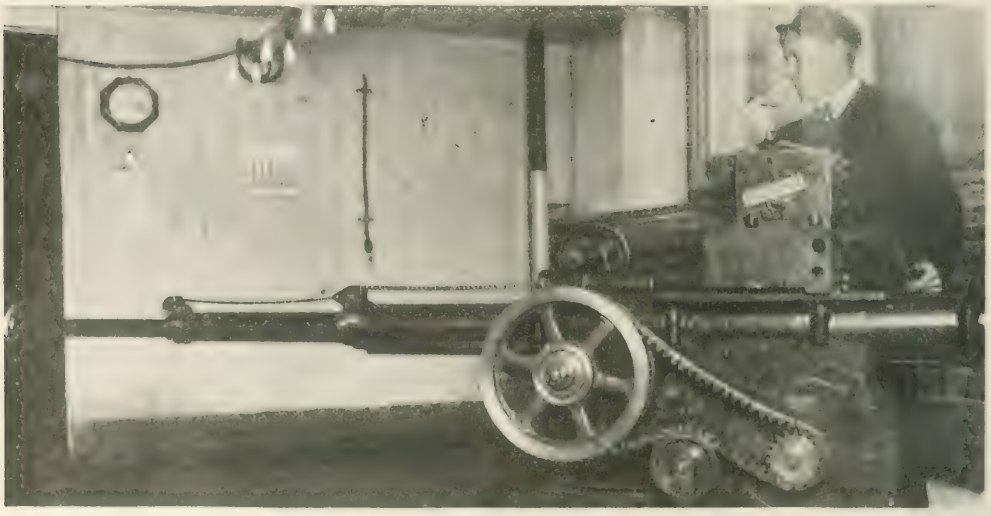
The electric current collected in this manner can be put to useful purposes. It can be made to ring chimes, operate an electrostatic relay and bell, a coherer and bell, a photographic discharge recorder, and so on. For meteorological purposes it is of great value, as it will indicate infallibly the variations of the weather. On the approach of a storm the intimation is conveyed by means of this instrument in no uncertain manner; the electroscope discharges very violently and rapidly and a continuous record of the phenomena can be secured.

STATUE OF NEGRO KING

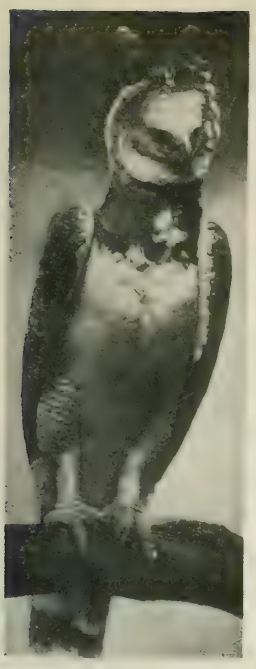
THE statue of a negro king shown by the accompanying photographs, was sculptured in the Congo during the first decade of the seventeenth century. Recently it was brought from that country and placed in the British Museum.

This statue is interesting, as it shows that African negroes had reached quite a remarkable state of civilization, and how far advanced they were in art, and proves at least that the artists of the Congo were not inferior to their confreres of the seventeenth century. The statue is of hard, fine-grained wood, taking on a very high polish. One finds naturally, in the entire work, conventional proportions and details, but the expression is extremely good, especially in the profile of the face,

AN EXAMPLE OF AFRICAN SCULPTURE.



TELESCOPIC ELECTRIC RAM MOTOR.
Drives home the bags of powder charges for the big guns in Uncle Sam's Navy.



HARPY EAGLE.

while the minute details show a sureness of conception joined to a mastery of technique.

Tradition informs us that this African prince represented a remarkable type of humanity, being a great organizer and a creator of prosperous industries as well as an earnest advocate of peace. He reorganized the heirarchy, was besides occupied with humanitarian ideas; instructed his soldiers to wound, but not kill their enemies, and forbade the use of many cruel weapons. His people for three centuries have considered him their national hero, however it is not to war that he owes his glory, as he is venerated for having been an advocate of peace and a patron of manufactures and the arts.

PERHAPS THE ONLY LIVING HARPY EAGLE IN CAPTIVITY.

QUEEREST OF EAGLES

THIS bird looks like a clergyman in full canonicals. He is posing for his picture at the Zoo in Washington. He is a kind of eagle—the largest of all species of eagles, in fact, with the exception of the monkey-eating eagle of the Philippines. For reasons not very well explained, he is known as the "harpy eagle."

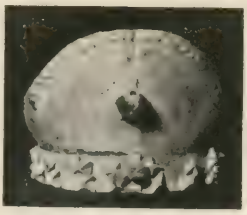
The harpy eagle is an American bird, but probably it is never seen within the limits of the United States. It belongs in tropical latitudes, and ranges up through Central America and Mexico.

PLOW TURNS TEN FURROWS

FARMING methods are being revolutionized in Arkansas, where rice culture is being carried on extensively. One

TRACTION PLOW IN ARKANSAS

hundred thousand acres were planted to rice on the Grand Prairie in the eastern part of the state last spring, an increase of more than 200 per cent over the 1909 acreage. The average yield last year was 74 bushels per acre; the average profit more than $50 net per acre. On account of such vast tracts being tilled, the plowing was done by traction plows for the most part. The one shown in the illustration turns ten furrows simultaneously.



ANCIENT SIGN OF ROYALTY.
The crown of an Inca king, with an uncut amethyst in the center.

went faster than man has ever traveled before, little publicity was given the instrument to which he owes the correct recording of his remarkable time in hundredths of a second.

The instrument used and shown, together with a cut of the inventor, Mr. Warner, is known as an automatic race timer. The timer is equipped with four wheels of type, operated like an odometer, which record hours, minutes, seconds, and hundredths of a second. A carbon ribbon is utilized for inking and the record is made by small, magnetically operated hammers suspended over the moving type wheels. In the circuit of the magnet

AUTOMATIC ELECTRIC AUTOMOBILE RACE TIMER AND ITS INVENTOR, CHARLES WARNER.

ELECTRIC RACE TIMER

WHEN Barney Oldfield recently broke the world's record for a mile at Ormond Beach, Florida, and

TOOTH DRILL IN LONDON SCHOOL.
A lesson in the care of the teeth.

that actuates the hammer is a switch on a closed circuit. A light wire of copper stretched across the course six inches from the ground connects to a trip, which breaks the circuit, releasing the hammers and allowing them to print the elapsed time.

A small motor drives the type wheels at a constant speed which is corrected every second to one one-thousandth of a second. With this device an absolutely correct and impartial record of the time is printed on a sheet of paper as unimpeachable evidence.

A Bird Pagoda.
Bird house built in form of Chinese temple.

THE BEGINNING OF A LOG JAM IN THE ST. MARIE'S COUNTRY OF NORTHERN IDAHO

LUMBER IN THE WEST

IT is conservatively estimated that there are 350,000,000,000 feet of standing timber in the region between the Rocky mountains and the Cascade mountains, comprising Washington, Oregon, western Montana and southeastern British Columbia. This timber converted into merchantable lumber would provide sufficient material for the construction of 17,000,000 four-room and five-room buildings, a larger number than were shown by the 1900 census to be in existence in the entire country. At the present rate of cutting, this available supply of the inland empire would last more than 250 years, not allowing for any future growth. At the prevailing cost of cutting and marketing, placed at $10 a thousand feet, labor would receive $3,500,000,000, an amount sufficient to rebuild three-fourths of the free, unencum-

Japanese "Hello Girls."
View in Tokio telephone exchange.

A Communal Kitchen.

bered homes of the United States. Between 40,000 and 50,000 men are employed in the Inland Empire converting this timber into lumber, at wages ranging from $2.25 to $7 a day. Transportation of this annual output requires nearly 70,000 freight cars.

COMMUNAL KITCHEN

ONE of the largest successful communistic societies in the world is located at Amana, Iowa, where the Society of True Inspiration owns 26,000 acres of fine tillable land. The society numbers 1,800 people, all of whom are bound together by the strongest ties of religion and blood kinship. While the various families occupy separate houses, they partake of their meals in common, in kitchen houses where the cooking and table-serving and dish-washing are done by the women of the various families. These kitchen houses are kept immaculately clean. It is not a case of too many cooks spoiling the broth, as the women work together with the utmost harmony, and the menus prepared are delectable to the members of the colony, who are for the most part Germans. After partaking of their meals the various families retire to their own homes where each member has a separate room. The colonists to the outsider, appear most unsociable, for conversation, while not absolutely tabooed, is rare.

The Turbulent Sea of Air
Why it is safer to fly high.

TESTING INSULATORS

WHEN electric current is carried overland at a high pressure for great distances much of the success of lighting a big city depends upon the efficiency of the large porcelain insulators used to support the line wires.

Every insulator that is put in the line must be absolutely perfect and stand up under the great strain during snow, hail, or rain. The photograph shows a test of 1,200 new insulators in an insulation factory. The insulators are being subjected to the great pressure of 100,000 volts and during the tests the testing room is pervaded by the weird sound, much like wind blowing through trees, which is made by the leakage of the great pent up current into the atmosphere. If an insulator suddenly breaks down under the test a lightning-like flash is often seen.

1,200 Insulators in Factory Under Test at 100,000 Volts.

How the Carving Was Inserted in the Bottle is a Mystery.

REMARKABLE WOOD CARVING

THE remarkable set of wood carvings shown sealed up in the bottle, are the work of a Chinese artisan, past master in the art of carving. The carvings are all made of one piece of wood and are all linked one to the other. How the carving was inserted in the bottle, is a mystery.

WATER-POWER TRAMWAY

THE accompanying illustration shows the construction of one of the most picturesque and interesting of mountain aerial tramway lines in the world, in operation at a slate quarry in California. The tramway is operated directly by water power. Between the quarry and the railroad is the canyon of the American River and the Kelsey Canyon. The wagon road is very difficult to travel and at times impassable.

While the difference in elevation is not great, the contour of the ground over which the line passes is quite rugged. The span across the American River Canyon, shown in the accompanying illustration, is 2,400 feet in the clear, and the height of the cables above the river something over 600 feet.

Special receptacles are used each holding a square of slate weighing about 700 pounds. There are 85 carriers in all, and the capacity of the line is 300 squares of slate per day. The cost of transporting the slate by teams was prohibitory. The question of transportation became a serious problem to the company and after giving the matter much thought and study the only solution appeared to be an aerial tramway.

Long Span of Tramway, Kept [illegible] Above the Canyon.

ONE CRAB OR TWO?

HOW many crabs have we here? It looks like two. In reality, however, there is only one, and he is changing his shell—caught in the act by the camera.

Unlike ourselves, the crab wears his skeleton on the outside of him. His only way to grow is by taking off his suit of defensive armor, and putting on a new one of suitable size. When the crab in the picture shall have withdrawn himself from his shell, he will be just about 60% per cent bigger than he was before.

This means that his

How Many Crabs?

system has recently been undergoing considerable compression. When he has divested himself of his armor, which comes off complete in one piece, he is a "soft" crab, and entirely defenseless against an enemy for a few days. During that period, however, the delicate skin that covers him rapidly hardens into a new suit of clothes, so that before long he is in a position to fight anything that comes along.

Cable Bridge Over Spokane River.

Incidentally in the process of changing his outer garment, the crab throws up the entire lining of his stomach and intestines. Hence it comes about that a soft crab is not only very good to eat, but exceedingly wholesome, being absolutely clean—a thing which cannot be said always of hard crabs, inasmuch as the animals are very foul feeders, eating anything and everything that comes within reach of their claws.

MACHINE LAYS PIPE

THE residents of arid lands have long felt the need of a device that would manufacture and lay a continuous concrete pipe. The necessity becomes apparent whenever there is an irrigation or drainage project on foot. The jointed pipe is expensive, and the joints will become separated. Roots will find their way through the tiny crevices and force the sections apart. At Santa Monica, Cal., the problem has been solved by the invention of a machine that lays a continuous line of concrete pipe, which is polished within and without as it is deposited in the ditch. The machine moves along in the ditch ahead of the finished pipe. The machine may be operated either by hand or power and will manufacture pipe up to thirty inches and as

Machine Which Lays Continuous Cement Pipe.

CABLE BRIDGE OVER RIVER

CABLE bridges swaying precariously in the wind are by no means rare in the Pacific Northwest, where turbulent streams are crossed by their means. The accompanying picture shows such a bridge over the Spokane River, near old Fort Spokane, about sixty miles below the present thriving city of Spokane. Passage across the bridge is not nearly so hazardous as would appear, as the cables are firmly anchored in solid granite and bear substantial footboards two feet wide. Some of the best trout fishing in the world is to be had in this part of the country, while the scenery is unsurpassed in the entire northwest.

The Pipe Machine at Work.

THIS TREE SPROUTED AT THE TIME OF THE FALL OF ROME.

small as may be desired. The engraving is that of a working model, ready for operation in the ditch. The view is a rear one, and the little cartridge-like trailers are the devices which polish the pipe inside. They are pulled through the core of concrete as the machine advances. Some of them make revolutions, to smooth the interior surface, but the last one is coupled by means of a swivel link and it does not turn. Another engraving shows a finished piece of the pipe as connected with iron water pipe and faucets. This withstood a test of 200 pounds pressure and not a drop of water was forced through the pipe. There is absolutely no percolation. Pipe laid fourteen years ago with this device is still in the ground and giving satisfactory service. One illustration shows a front view of the device, the wheels being those on which the machine moves forward as forced by the pipe discharging from the rear. The concrete is dumped into the hopper, where it is forced backward by a jack screw, which is caused to revolve by the turning of the wheel mounted on an upright frame.

BIG TREE

A SECTION of one of the largest and oldest trees in the world, a remarkable example of one of the big trees of California, a giant Sequoia, from the western slope of the Sierra Nevada Mountains, from the Kings River grove, at an altitude of 8,000 feet is shown in the illustration. The big tree was 300 feet tall, symmetrical, and entirely free of limbs for nearly 200 feet. Eight feet from the ground the trunk was 62 feet in circumference, while at the ground it measured 90 feet. The section shown in the photograph was cut 12 feet from the base and is four feet in thickness, weighing 30 tons. The specimen is 16 feet 2 inches in diameter, measured inside the bark, which in places is nearly a foot in thickness. The small cards which are seen on the tree mark the successive centuries and give the growth of the tree during each hundred years. The ring shows that the tree was 1,341 years old when cut down, and began its life A. D. 550, or only 74 years after the Fall of Rome.

COBBLESTONE URN

INSTEAD of paying to cart away the cobblestones that cumbered his lot a Los Angeles householder not only utilized them for the foundation of his house, but also constructed a beautiful ornament for his garden, in the shape of an urn. Some care is needed in securing the right mixture of cement and setting.

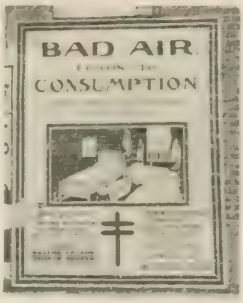
A RIVAL OF ROOSEVELT
Prince Arthur of Connaught

EDISON'S ELECTRIC GARAGE

THE accompanying illustrations show the exterior and interior of Thomas A. Edison's electric automobile garage. The interior view shows the mercury arc converter and switchboard with several electric vehicles equipped with the new Edison storage battery and indicates the method of charging them.

The garage is located at Llewellyn Park in New Jersey, and Mr. Edison has designed this structure and arranged its equipment as a model of up-to-date practice for charging vehicles equipped with his new storage battery.

Edison's new storage battery not only has greater durability and output per pound of battery but eliminates a long list of troubles and diseases inherent in the old type.



A BILLBOARD PRESCRIPTION.

PRESCRIBING BY BILLBOARDS

IN the Southwest where large numbers of consumptives are to be found, steps have been taken to assist the unfortunate health seekers, many of whom have the impression that merely to be in the desert is sufficient to guarantee their cure.

To induce these people to observe sanitary precautions which are as necessary in the Southwest as anywhere else, the Arizona Health League has placarded the walls of Tucson and other cities of the territory with prescriptions ten feet high, in the form of posters.

One of the most striking of these is reproduced here. The picture represents one of the overcrowded tenements against which this warning is directed.

Other posters of the same large size

INTERIOR OF THOMAS A. EDISON'S ELECTRIC GARAGE.

EXTERIOR OF EDISON'S ELECTRIC GARAGE

SOLAR HEATER.

and bright coloring prescribe walking in the open air and sunlight, and caution against promiscuous expectoration. The idea of prescribing by billboard is a novel one and cannot fail to accomplish good. The posters are issued by the National Association for the Prevention of Tuberculosis and the printing and posting of the unique advertising is done gratuitously.

SOLAR HEATER

THE solar heater shown in the accompanying photograph can be readily duplicated by any local plumber, as it consists merely of four-foot lengths of iron pipe jointed together and set up on a scaffold or roof. In a warm climate it will supply hot water for a bath or other domestic purposes without the necessity of a fire in the house. In Arizona, where the thermometer often registers above 110 degrees, one can draw water from such a device sufficiently hot to steep tea.

OLD SHOE USED AS WAGON BRAKE.

RINGS CARVED FROM FISH BONES

THE accompanying illustration shows four quaint rings that have been fashioned from the bones of different fishes. They are the work of a stoker on one of the English man-o'-war. During his leisure hours, the stoker carved these rings with an ordinary pen-knife and file, from the vertebrae of fish which he caught for the purpose.

TRULY A BRAKE SHOE

IN certain parts of rural England the carter makes good use of his cast-off hob-nailed boots and shoes. They are used as a wheel brake in the manner shown in our photograph. The boot, by reason of the tough, nail-studded, leather sole works splendidly.

OLD GERMAN TWO HANDED "FIGHT-SWORD."

SAVING LOST FISH

WHENEVER the Mississippi River overflows its banks, it leaves behind, on its retreat, thousands of temporary ponds and lakelets full of valuable fish. After a few weeks the pools dry up, and the fishes are left to die for lack of water.

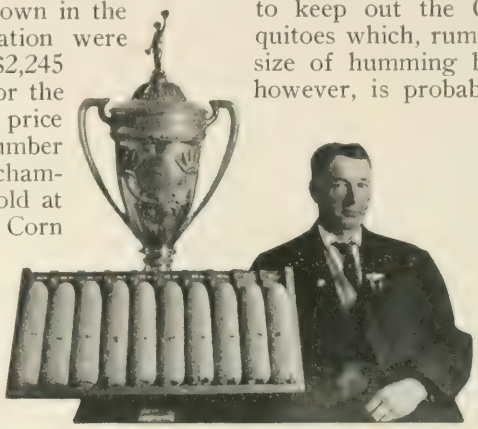
The United States Fisheries Bureau makes a regular business of saving the fish, by seining them out of the ponds and shipping them in milk cans to where they are wanted for stocking lakes and streams.

RINGS MADE FROM FISH BONES.

THE OUTDOOR SLEEPING ROOM.
(On the right.)

WORLD'S MOST EXPENSIVE EARS OF CORN

IT is stated that the champion ten ears of corn shown in the accompanying illustration were sold at the rate of $2,245 per bushel, or $335 for the ten ears, the highest price ever paid for that number of ears of corn. The champion single ear was sold at the Omaha National Corn Show for $85, or at the rate of $5,950 per bushel. This is said to be the highest price ever paid for a single ear and shows the value growers of King Corn place upon these remarkable specimens as seed from which to grow the most valuable corn.



J. OVERSTREET, THE CHAMPION CORN BREEDER, AND TEN EARS OF CORN WHICH SOLD AT THE RATE OF $2,245 A BUSHEL.

It is held that the champion ten ears of corn in the illustration averaged 10½ inches in length and 7¾ inches in circumference, each ear carrying 20 rows of kernels. The depth of kernel was three-fourths of an inch and the average weight of each ear 20 ounces.

On good corn producing land, this corn, it is held, is one of the largest yielders known, for when the land is well cultivated it will make from 75 to 100 bushels per acre. Corn improvement, it is claimed, is as yet in its infancy, and while there has been wonderful improvement in quality and yield in the Middle West in the past ten years, there is still room for improvement, and it is believed by many growers that the yield per acre may be increased to double what it is today as a result of careful breeding and intelligent selection.

SLEEPING IN A BIRD CAGE

TO the stranger in Yuma, Arizona, it would seem that the inhabitants were very fond of birds, for one sees what appear to be aviaries in the back yards, on the roofs or most any convenient place for looking after pets. These "aviaries" are wooden frames, roofed and entirely covered with wire screen. As a matter of fact they are the outdoor sleeping rooms which are almost indispensable in that climate, and the mesh is not to keep birds from flying away, but to keep out the Colorado River mosquitoes which, rumor says, are about the size of humming birds. This estimate, however, is probably exaggerated.

FOR DIVERS' EARS

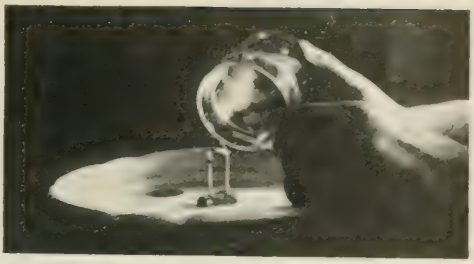
SWIMMERS are frequently annoyed by having water fill the ears. This may be obviated by the use of an ear-plug which has recently been patented. It consists of a rubber bulb, in which a tube is fitted, provided with a drum.

DAVITS ON JAPANESE WARSHIP.
With these two little lads can launch a large life-boat.

MATCHES MAKE VACUUM PUMP

A VERY interesting trick which depends upon a simple law of physics consists in removing a coin from a plate of water without wetting the fingers or spilling the water. The method is shown in the accompanying illustration.

Cut a cork in two parts, and in each stick a match so that it will float upright. Light the two matches and place a glass tumbler over them as quickly as possible. The burning matches use up the air inside the glass, causing a partial vacuum in it. The water in the plate is thus drawn up into the glass, leaving the coin high and dry.



To Remove Coin from Water Without Wetting Fingers.

OLD ROMAN BARGE FOUND IN LONDON

IN digging the new foundations of the new County Hall, the London County Council has discovered a relic of Roman days—a long oak barge, pressed flat by the weight of the Thames mud above it.

When the barge sailed the Thames the river was a pellucid stream with a clean sandy bottom.

The barge was cunningly contrived with a stout keel, perhaps fifty feet long, side ribs set twelve inches apart, and an inside beam measurement of sixteen feet to eighteen feet. It was built with two inch flanking boards, and neatly rounded dowel-pins holding everything together. Not a piece of metal went into its making. It was all fine oak.

About half the boat has been uncovered. Its black ribs are bare to the sky, sodden with water and soft to the touch. So rotten are the black timbers, waterlogged for centuries, that preservation is almost out of question.

In the days when the boat sunk, the stream of the Thames took a course one hundred yards to the southward of its present line. The red sandy river bed has been laid bare, and upon it the barge rests—an object lesson in the history of London and the Thames. When it was in its prime, the Roman legions were at war with the savage Angles under the leadership of their valiant queen, Boadicea, and only it could tell of the deeds of bravery it witnessed when England was young.

Largest Projectile in the World.
Shell of 16-inch rifle at Sandy Hook. Weighs 2,400 pounds and costs over $1,000 to be fired.

Roman Ferry-Boat Found in Excavations in London.

A TABLE VALISE

SINCE the advent of the automobile, a great deal of ingenuity has been expended upon inventions of useful objects which may occupy as little space as possible and at the same time give additional comfort to the automobilist.

The new table valise is a combination which serves a twofold purpose, assuring the tourist of a table on which food may be served, as well as a place for carrying clothing or anything else that may be needed on the journey.

VALISE TURNS INTO TABLE.

It is a solid box, the interior forming an excellent valise, spacious and conveniently arranged. Movable shelves fold over the cover of the valise; when unfolded they form the top of a table. Four legs are skillfully concealed in the lower side of the valise, when unfolded they support the table, which then takes the form shown in our illustration.

Motorists who are on extended tours will probably find this folding table very convenient for *al fresco* meals.

ALBATROSS LOVE DANCE

THIS photograph was taken on Laysan Island, which is a small member of the Hawaiian group—chiefly noted through the fact that it is, and has been for thousands of years doubtless, the resort of countless sea-birds. These are of several species, but most conspicuous among them are albatrosses. The island is the greatest albatross rookery in the world.

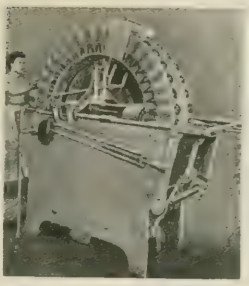
THE DANCE OF THE ALBATROSS.

The birds are tame enough, if not disturbed, and naturalists have found there excellent opportunity for studying the albatross at home. The picture shows a "love dance," in which two of these beautiful birds are engaged.

Unfortunately, ruthless feather-hunters have destroyed the birds of Laysan Island in enormous numbers, so that they are not nearly so numerous as formerly. Recently the Japanese have taken a hand at this cruel work, and our own government has been obliged to adopt special measures to protect the seafowl.

TO AUTO TO SOUTH POLE

IN view of the public curiosity as to the motor sledge recently tried by Captain Scott in Norway for use in his search for the South Pole, the accompanying illustration is of great interest. As will be seen from the picture, the driving wheels do not touch the ground. An endless chain fitted with spurs and pattens passes over these wheels and slides under each runner. The appearance when the sledge is moving is very curious, as the chain where it touches the ground appears to stand still whilst the sledge slides forward over it. This, in fact, is what actually takes place, the upper chain traveling forward at twice the speed at which the sledge travels.

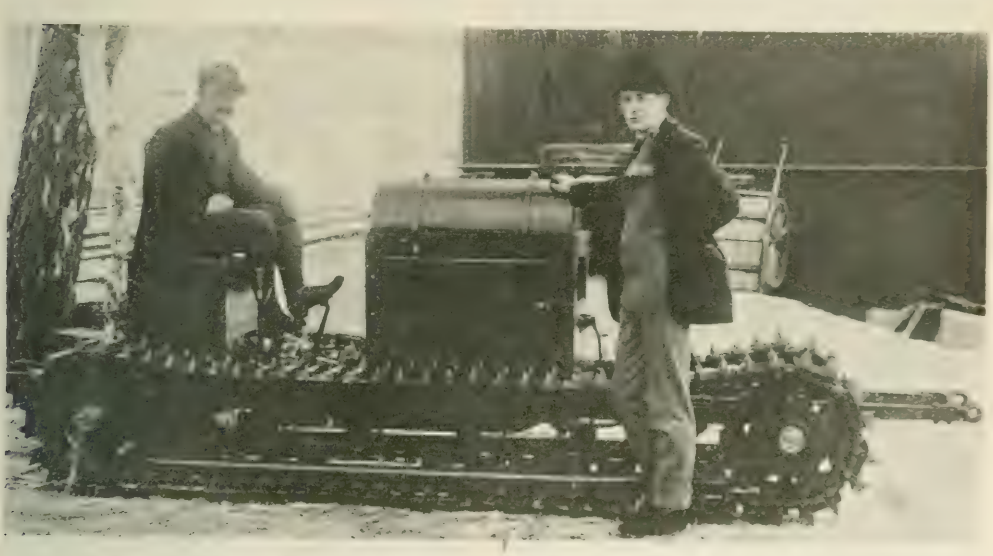


MACHINE WHICH WASHES BOTTLES BY THE DOZENS.

MACHINE WASHES BOTTLES

FOR industries using a great number of bottles daily, the rapidity of the work of cleaning bottles by machine is of great importance.

The Nash machine as illustrated shows a running gear which turns on three rollers, the bottles placed in pockets, neck downward. This carrying gear is put in rotary motion but with jerky stops. At one end of the basin two of the bottles at a time are pushed by a piston from their sockets when they plunge into a cylindrical brush, being rubbed by bristles which line the cylinder. The neck of the bottle is pushed into a sort of tube where a rod furnished with a brush enters and cleans the inside.



CAPTAIN SCOTT AND THE MOTOR SLED IN WHICH HE HOPES TO REACH THE SOUTH POLE.

PERHAPS ONE OF THE LAST SAILING

Hot Lunch Served on Traveling Motor Car.

After this cleaning which is done under a flow of water from the top of the machine the bottles are mechanically pushed back into their sockets and carried to the upper side of the machine; then during the stops the bottles are rinsed; one tube throws a jet of water on the outside; another enters the neck of the bottle. This water falls back on the brushes.

The cleaning is completed by injecting sterilizing vapor into each bottle. They are quickly dried by means of compressed air. Ten thousand bottles may be washed in ten hours and the work is as satisfactory as that done by hand.

AUTOMOBILE RESTAURANT

OUR illustration shows the first motor lunching party that have been enabled to enjoy a hot luncheon cooked in this commodious motor caravan while traveling at a speed of thirty miles an hour along the Surrey roads to Brighton from London. As will be seen the chef has a compartment all to himself, the restaurant part of the car seating eight people comfortably.

THE PHOTOGRAPHONE

A SWEDISH invention, called the photographone, by means of which it is said that sound-waves can be registered on a photographic plate, promises wonderful possibilities. The negative is developed in the ordinary way, and the sound-curves transferred to rubber plates, from which the sound is reproduced as by the gramophone. Any number of photographone records can be produced and if the original music or song should not be strong enough to fill a large concert hall, the sound can be increased as desired.

WASHINGTON'S WATER POWER

ENGINEERING experts place the aggregate of water power in the State of Washington at 3,000,000 horse-power, of which only 116,000 horse-power is now in actual operation. There are, in addition, in process of building, projects which will develop 163,000 horse-power, while other projects are being financed which will add to this total 242,000 horse-power. One county in Washington alone has thirty waterfalls, each one of which would produce several thousand horse-power. Many of them are removed a considerable distance from settlements and it will be some time before the falls are ever harnessed to work for man.

One of Thirty Water Falls in Stevens County, Washington.

BAMBOO IN TEXAS

THE experiment of growing bamboos is meeting with remarkable success in south Texas. The plants seem to be as well adapted to the soil and climate of that region as in their native lands. Some of these bamboo are now more than three years old and have attained heights of more than sixty feet. While no attempt has as yet been made to convert the jointed stalks to commercial uses it is said that the matter of making furniture and utilizing the material for a variety of other purposes is in contemplation by the growers in Texas. It is known that the bamboo are specially serviceable for windbreaks and they will probably be extensively used for this purpose in the lower gulf coast region of that state. One of the serious problems to the farmers and gardeners of that section is to provide some cheap and effective method of protecting the growing crops from the terrific wind that sweeps inland from the ocean during nearly the whole of the year. It has been demonstrated that the bamboo are ideally fitted for barriers against the wind and that a hedge of them planted on the windward side of a field insures protection to the growing crops for many years. The plants require no attention and often attain a height of twenty to thirty feet the first year. They lend a picturesque, tropical beauty to the farms and gardens.

Bamboo In Southern Texas.

Teaching School Girls to Care for Babies.

BABIES AS OBJECT LESSONS IN PHILADELPHIA SCHOOLS

THE scientific care of babies is a new course added to the education of the girls at the public schools of Philadelphia. Physicians, assisted by trained nurses, and with a real baby as a model with which to illustrate the talks, are in attendance at regular sessions of the girls' schools to teach the future mothers of the nation how to raise healthy babies with the least trouble.

The milk bottle plays the most important part in the "properties" of the lecturer. The girls are shown how to wash the baby's bottle thoroughly, how to prevent the collection of germs in the rubber nipple, how to keep the baby's mouth clean and what to do and not to do to insure the milk itself being wholesome and free from impurities.

The live baby is brought into service to show just how a youngster should be washed and dressed and how it should be placed in its cot and how protected from cold in winter and from overdressing in summer. The picture shows one of the new classes in session at one of the Philadelphia schools.

THE OCTOPUS CAUGHT IN THE WICKER TRAP.

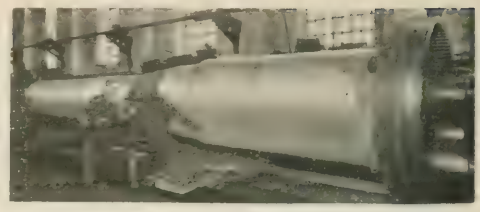
CURIOUS OCTOPUS

OF all the weird and remarkable sea monsters from tropical waters, probably the rarest to pubic eyes is the curious octopus. It is a prize exhibit in any aquarium where it is kept. It is often taken in the large wicker fish traps used everywhere in the West Indies and in Bermuda and also captured by divers, who seize it with their hands. It is frequently caught with hook and line, but when hauled up clings so tightly with its sucker-covered arms to the side of the boat that it cannot be loosened without injury.

The lair of the octopus is indicated by the scattered shells of mollusk or crustaceans, such as oysters, clams, mussels, scallops, spiny lobsters and crabs of many kinds lying in front of it. The animal carries most of its food to its hiding place, and the quantity of rejected shells thrown in front of it forms a conspicuous mound sometimes a yard in diameter and a foot in height.

In capturing the octopus alive, the diver thrusts a handful of salt wrapped in dough into the hole occupied as a hiding place. The immediate softening of the dough envelope liberates the salt, which irritates the animal and causes it to dart out, when it is seized with the hands by the diver.

The octopus does not discharge the contents of its ink bag until after it has darted from its lair. It attempts to retreat under the cover thus afforded, which is sufficient to cloud the water for a couple of feet. While occupying its lair, it has the habit of clearing the entrance of any small objects that may be thrown there, by a discharge of water from its siphon. When disturbed it gathers the nearest empty shells, which adhering to the strong suckers of its arms, are used as a shield to guard the entrance.



TURNING A JACKET FOR ONE OF THE NAVY'S BIG GUNS.

GIANT BERMUDA OCTOPUS

Rides Across River in a Bucket.

NOVEL FERRY

A GLANCE at this dusty river bed would convince a thoughtless person that there was no need of bridge, boat or aërial tram to get across. But like many of the other southwestern rivers the San Pedro may be dry in the morning and a raging torrent by noon, owing to heavy rainfall in the mountains. The citizens of Mammoth, Arizona, finally got tired of being held up for half a day at a time on the wrong side of the river, which is about a quarter of a mile wide at that point and so they installed an aerial tram from the scrap heap of an abandoned stamp mill. At one side the cable is attached to a huge cottonwood tree and on the other to a couple of stout timbers and is kept taut by a crude system of weights, although at the time this picture was taken most of the weights had been removed and the car was resting on the ground.

The motive power of this strange ferry is the brawn of the passenger, who simply pulls himself along by grasping the cable. The ferry is efficient enough for passengers and packages but heavier loads must wait till the river goes down.

England's Preparation for War.
The girl scouts being inspected by General Baden Powell

Where Old Glory Meets the Union Jack.
Summit of White Pass, Alaska.

ALASKAN BOUNDARY

THE summit of the White Pass in Alaska, which was at one time marked by the buried hopes and bones of hundreds of gold seekers, is now marked by the Union Jack and the Stars and Stripes in close proximity. The summit has lost most of its horrors since the railroad has conquered that region, thus making a Yukon trip easy as compared with the days when men struggled up the Pass with their packs on their backs and considered five to ten miles a good day's progress.

British Soldiers Leaving [illegible]
Major Edward [illegible]

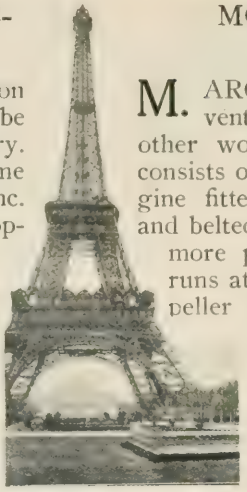
LEMON BECOMES ELECTRIC BATTERY

THE accompanying illustration shows how a lemon may be converted into an electric battery. Put inside a half a lemon, some small pieces of copper and zinc. From the last pieces of copper and zinc run two wire leads.

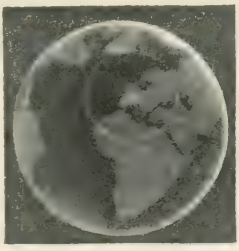
By putting the end of one wire on the tongue and the end of the other over it, an electric current can be felt after a few seconds.

GRASS RAINCOATS IN MEXICO

IN the tropical region of Mexico where heavy downpours of rain are of daily occurrence during certain times of the year the use of grass raincoats by the natives is common. These coats are woven of a species of wild grass that grows in that part of the country. The coats shed the rain perfectly and are light and airy. Some of them are made with such a degree of skill that they are comfortable and of attractive appearance.



THE WIRELESS STATION ON THE EIFFEL TOWER.



THE EIFFEL TOWER STATION CAN SIGNAL EVERY STATION OR SHIP WITHIN THIS 2,000 MILE RADIUS.

MOTORCYCLE USES PROPELLER

M. ARCHDEACON, of Paris, has invented a "motor a voler," or in other words, a flying motorcycle. It consists of a six horse-power Buchet engine fitted across a motorcycle frame and belted to an aeronautic propeller, or more properly, tractor. The engine runs at 1,500 revolutions and the propeller shaft at 1,100 revolutions per minute. The speed of the machine thus attained is fifty miles per hour, or nearly as fast as the Twentieth Century Limited. As to whether the motorcyclist could endure this speed with the dust and wind continually driving in his face, unless he had a shield in front of his head is a question. The photo shows the inventor standing beside his machine. It will be noted that high steel rods bent in elbow form are brought up from the front to brace the extension shaft on which runs the flat belt and by means of which the wings or propeller blades in front are moved. It also serves to give additional rigidity to the cycle frame. The steering is done mainly by wheel instead of from the handlebars, as with ordinary motorcycles and bicycles. Handlebars would not give sufficient control over the machine, when going at full speed, the wheel responding to every slight movement and acting directly upon the propeller shaft through the steering head brought out close to the saddle. Handlebars are fitted, however, as they can be used to guide the machine when it is moving slowly and while getting it tuned up for speed.

While automobiles have been driven by air propellers in several instances, the motorcycle described above is probably the first two-wheeled vehicle to be thus equipped.

THE LEMON BATTERY

GRASS RAINCOAT IS A PERFECT WATER PROOF.

WATER FROM TREE

THIS remarkable feat of drawing a stream of water from a living tree is one of the curiosities of a California resort. It is not quite as miraculous as it seems, however, as the water pipe runs right through the tree, slanting downward from the knot-hole where the faucet projects, and entering the ground about the roots on the other side. There is nothing to indicate where the pipe went except a little patch of cement on the ground at the base of the trunk, and many a visitor to the resort goes away without having solved the mystery.

THE WIND CYCLE.

WATER RUNS FROM TREE.

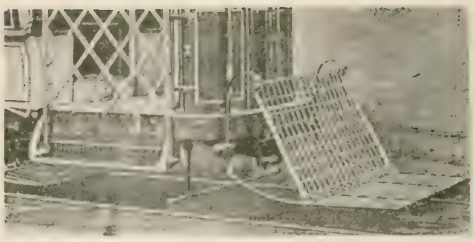
FIGHTING BAD AIR A NEW PROFESSION

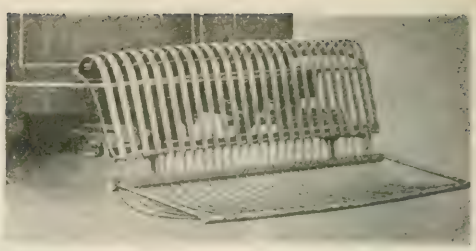
THE "ozone engineer" is the latest specialist of the engineering profession, and his field seems likely to grow rapidly in the United States, for this country is now overtaking Europe in the use of ozone for air and water purification, and for a hundred special purposes in the industries. In Europe, however, he already has achieved great importance and a field which extends around the world, for it is said that in one European country last year over $7,000,000 was expended for ozone apparatus.

The Yankee is accustomed to believe that his countrymen are in advance of the rest of the world in ingenuity, but the United States has lagged behind the European countries sadly in the adoption of ozone for the purposes for which it was found years ago to be highly potent. In European factories ozone has been doing for years what the Yankee has sought to do by less effective means, and which he is beginning now to do with ozone. Bleaching of textiles and feathers, refining of oils for soap, and of lard, preserving of fruits and produce, and sterilizing of surgeons' instruments and clothing, and the air of operating rooms in hospitals all have been found to be important uses for ozone, and consequently for the ozone engineer.

It is likely that this profession, in the development which seems just ahead in the United States, will achieve some tremendous changes in the industrial world. The ozone engineer will broaden the usefulness of the ventilating engineer for the reason that ventilating methods of the most approved sort fall short of the needs in large auditoriums, theatres, churches, school rooms, factories and other places where great numbers of people gather. Already some large tasks have been set for ozone engineering in water purification. Kansas City is considering the adoption of a water purification system and employing

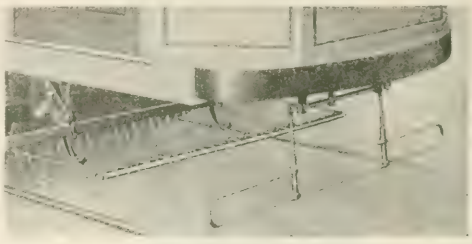
ARCHDEACON AND HIS WIND CYCLE.





FOR THE SAFETY OF PEDESTRIANS.
New types of street car fenders.

ozone, and it already is in use at Ann Arbor, Michigan, where a million gallons is treated with only ninety kilowatt-hours of electrical energy, making the cost of treatment so exceedingly low that adoption in other cities is to be expected. Tests are now being made with this in view at the Massachusetts Institute of Technology, and other technical schools are waking up to the new field of engineering which ozone has created.



NOVEL STREET CAR FENDER.

In Pittsburg, at the Homeopathic Hospital, an ozone plant not only has been employed to purify water, but also, following the example set in hospitals of Paris and London, ozone is used for sterilizing instruments, bandages, etc., and for dressing wounds and ulcers. Ozonized air has been found to shorten the time of convalescence. The later methods of production by the electrical process have shown that an instantaneous contact of oxygen in the air with the high voltage of electricity which is employed for the purpose, best accomplished the desired result.

The field which lies before the specialist in the use of ozone is exceedingly interesting.

JAPANESE OFFICERS BEFORE PORT ARTHUR.
Made of [illegible] wicker work.

LIFE BOAT WITH NEW RELEASING GEAR.

MACHINE TESTS ARTIFICIAL WINGS

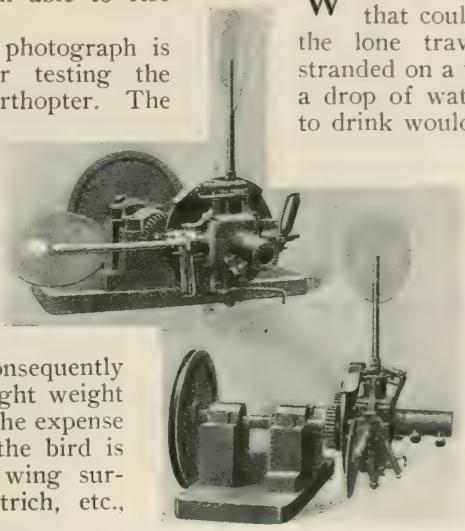
THE brilliant results obtained by aeroplanes have not satisfied a certain number of engineers who declare that these machines will never navigate the air with safety; believing that a sudden fall of wind, and unexpected gusts near the earth will render them always dangerous.

The idea of imitating the movement of the wings of a bird, copying nature, has led them to invent machines with flapping wings, *orthopters*. A few models that have been constructed, however, have never been able to rise from the ground.

The accompanying photograph is of an apparatus for testing the movements of the orthopter. The two fixed paddles are of very small dimensions, and are simply to show their use.

If nature has produced birds that fly, it is because they have been created small, and consequently light, supporting a slight weight per square foot, with the expense of little energy. If the bird is heavy and of slight wing surface, as the hen, ostrich, etc., flying is impossible.

An expert French engineer says that "man has succeeded in making small machines with beating wings, but will never succeed in raising a weight as heavy as his own."



MACHINE FOR TESTING ARTIFICIAL WINGS.

BRUSSELS' ELECTRIC LIGHT POLE TIPS FOR TRIMMING.

ROCKY MOUNTAIN GOATS.
They insist on climbing over their logs.

THE TRAVELLERS TREE

WHO would not welcome a tree that could quench the thirst of the lone traveler, who had been stranded on a waterless waste, where a drop of water that could be used to drink would be almost a novelty? This is what one may find traveling in Madagascar, where the torrid sun has parched the ground, and all vegetation is at a standstill, and even the thought of water is a pleasure. On this island is to be found the travelers tree, (Ravenala Madigascariensis). The stems resemble the ordinary palm, but send out leaves only on two opposite sides, like a great expanded fan. The lower leaves drop off as the stem grows, and in an old tree the lowest leaves are sometimes thirty feet from the ground.

A tree often has twenty to twenty-four leaves, the stalk of each leaf being six or eight feet long, and the blade four to six feet more. The blade of the leaf is oblong, bright green, and shining. The fruit of this tree is not succulent, but is filled with a fine silky fiber, of a most brilliant blue, and contains about thirty or forty seeds. The leaves are much used for thatch, and for many other purposes, but the most wonderful thing about this tree, is that the leaf-stalks

Wren's Nest in Signal Post.
Laid and hatched two eggs on rocking beam of signal.

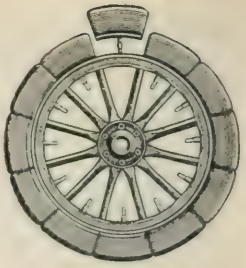
always contain water, and this is why it is called "the travellers tree." Even in the dryest weather, more than a quart can readily be obtained by piercing the thick part of the leaf-stalk. This water is very pleasant to the taste, and has many times saved the life of some man who has been wandering with parched lips through the unknown wild.

Where the leaf-stalk makes its connection on the body of the tree, is to be found the precious water, and by climbing up the leaf and pulling it out the water will spurt out very freely on both sides.

PNEUMATIC TIRE IN SECTIONS

THE "unit idea" is becoming so widespread in its applications that it is not surprising to see it embodied in almost anything. The most recent development in automobile tires abroad consists of twelve sections of tire, each having its own valve, and each inflated separately. Should any one of the twelve sections burst or be punctured, it is only necessary to remove that particular section and put on a new one. Several extra sections can always be carried inflated and ready to be put on at a moment's notice.

While this idea has not been before applied to the automobile, it was adapted to bicycle tires several years ago but at that time did not prove very popular. There seems to be no reason why this method should not be both convenient and economical, as pneumatic tires seldom wear out all around the same amount or go to pieces all at once. A separate section can be inserted in an instant; or, if no extra sections are at hand, the car can run on the remaining eleven sections with no damage to the rim and only slight discomfort to the passengers. It is doubtful, however, that this sectional tire is as resilient as the old-style pneumatic.



Auto Tire in Sections.

The Traveller's Tree.

Modelling Zebra from Life.

Rolling Armor Plate.

FLOATING CHURCH

WEDDING PROCESSION TO FLOATING CHURCH.

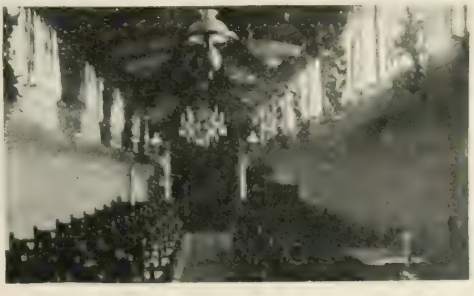
BERLIN can boast of having one of the most unique churches in the world, as she has provided for her many boatmen a floating place of worship, which is moved around on her many miles of harbor. Our pictures show a bridal procession crossing the narrow gang-plank, while in the other we see the interior of the church.

CANVAS-COVERED TOBACCO FIELD.

TOBACCO GROWS UNDER CANVAS

GROWING leaf tobacco under canvas has become quite an industry in the vicinity of Nacogdoches, Texas. It was only a few years ago that the soil and climate in that section came to be recognized as well suited for tobacco growing, and since that time interest in this branch of agriculture has rapidly increased. The tobacco that is grown under canvas is said to have a specially agreeable flavor and its leaves enter into the manufacture of the highest grade of domestic cigars. The canvas is spread upon a framework about ten feet above the tops of the tobacco plants, and the mellow light that sifts through the cloth gives a peculiar effect to the green and thrifty plants.

The canvas covering also prevents rain from washing away the gum that forms on the leaves, thus adding to the weight.



INTERIOR OF FLOATING CHURCH.

ELECTRO-MAGNET SAVES SUNKEN CARGO

THE novel use of a powerful lifting electro-magnet in rescuing a cargo of nails from a sunken barge in the bed of the Mississippi River may be noted in the accompanying illustration. A barge loaded with kegs of nails sunk near New Orleans and the cargo was recovered by the magnet.

The powerful lifting magnet was lowered into the stream and five or

Man With Broken Neck.

six kegs of nails raised with each lift, after switching the electric current into the magnet coils. The derrick may be seen as employed for the purpose of lifting the magnet with its load of nails weighing half a ton or more.

It is stated that the cargo was valued at about $45.00 per ton and a loss of only about 10% resulted, the kegs being raised intact, the nails being uninjured except for slight rust, while a dredge if used would have broken the kegs open and much of the cargo been injured and lost.

Electro Magnet Raising Kegs of Nails From River Bottom.

A dredge would have been difficult to operate as the kegs of nails were raised from a depth of 70 feet. A cargo of woven wire sunk near Pittsburg also illustrates the use of the gigantic lifting magnets for recovering steel and iron cargoes and indicate an innovation in marine wrecking service.

MAN WITH BROKEN NECK

TO have one's neck broken and still live is a distinction possessed by but few people in the world. It is, however, one to which not many people would aspire. The photograph shows a back view of Mr. Alonzo Souslin of Dayton, Ohio, who had his neck broken in 1906, and has been obliged to wear the harness shown in the picture, night and day ever since. The harness consists of a leather vest laced about the body, with a steel mast extending up over and supporting the head by means of steel bands and straps over the head and under the chin.

Mr. Souslin is unable to turn his head even ever so slightly. He can sleep by lying on his side and eats without great difficulty. He complains of almost continuous headaches, however, and of a peculiar numb sensation in his left arm and leg. He is able to get about over the country and gains a livelihood for himself and family by selling postal cards bearing his picture.

NEW WATER-RAISER

AN invention of great interest to agriculturists and stock farmers the world over is that known as the Boonzaier multiplicator which enables a windmill to raise at least twice the quantity of water normally raised. The apparatus is the work of a South African farmer, after whom it is named, who quite recently gave our London correspondent some details of the multiplicator. The accompanying illustration shows the apparatus fitted to a windmill and taken at the moment of the upstroke. The first mill to which the multiplicator was fitted was a twelve foot "Samson," erected over a well in which it worked a four-inch cylinder with a twelve-inch stroke. With the same wind force and with the multiplicator the stroke transmitted was a twenty-four inch one and twice the quantity of water was raised. It was found that this was more than sufficient. The multiplicator has won a number of prizes.

Multiplicator Attached to Windmill

LOCOMOTIVE HAS CAB IN FRONT

THIS monster locomotive is in service on the Southern Pacific R. R. hauling its heavy freights over the Sierra Grade. It is one of the new type of large Mallet compound articulated put out for heavy service. Its peculiarity, however, consists in the position of the cab for the engineer and firemen. This is in front, just over the forward trucks, and gives an unobstructed view of the tracks. The position is a dangerous one, and a decided reluctance is shown by the trainmen to running on this engine.

LOCOMOTIVE WITH CAB IN FRONT.

SHACKLES OF SLAVES

ENGLAND is seeking the aid of the United States to suppress the slave trade in Angola, Africa, by boycotting Portuguese cocoa. The planters on the islands of St. Thome and Principe, of the West coast of Africa, obtain their slaves in Angola and ship them to the islands. Enroute to the coast the slaves are shackled to prevent escape. The shackles, as shown in the picture, are extremely primitive and yet very effective. They are made of blocks of wood with a fork for the neck, and holes through which the hands are passed when traveling, or the feet when sleeping. A wooden peg is drawn through the side dividing the ankles or wrists and making withdrawal impossible.

KEEPS SLAVES FROM RUNNING AWAY.

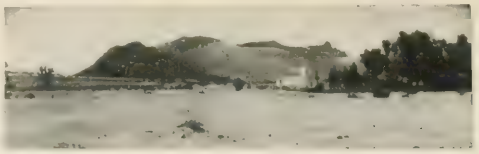
RATTLESNAKE FARM

FRANK B. ARMSTRONG of Brownsville, Texas, has been operating a snake farm for more than a quarter of a century and has found the industry interesting and profitable. He makes a specialty of rattlesnakes. Embraced in his collection, however, are many other kinds of reptiles. Mr. Armstrong raises his snakes in much the same way that hogs or other animals are fattened for the market. He sells the snakes by the pound, the prices ranging from twenty-five cents to one dollar per pound, but makes all venomous snakes harmless before he sells them. This is accomplished by an operation by which the poison sack is removed and the fangs extracted. From each rattlesnake Mr. Armstrong obtains liquid poison which is in great demand by chemists. The snakes are fattened on rats and mice caught by Mexicans, and are then sold to museums and circuses.

WAKING UP THE STOCK.
Scene on Texas snake farm.

TEACHES FARMING BY TROLLEY

WHILE it has become a custom in many of the states for the agricultural schools to coöperate with the steam railroad companies in the running of a train to instruct in farming, the Massachusetts State Agricultural college in co-operation with the New England Investment and Security Company, owning and controlling several hundred miles of electric railways throughout Massachusetts, have shown a brand new feature in the pressing of trolleys into this branch of agricultural instruction.



A Mountain of Iron.

The photograph shows one of the four large interurban cars that were given over to the "Trolley Farming Special" which covered nearly three hundred miles of track in the trip and stopped at almost every cross roads. Each car had the seats removed from it and the space was given over to the exhibits of the four separate fields of agricultural work. The lecturers came from the teaching force of the college and stops varying from 40 minutes to an hour were made. The lecturers slept in the cars and at each stop delivered lectures on popular agricultural topics.

Urn Made of Cobblestones.

The cars all made the 300 mile trip without any accident of any kind whatever in spite of the fact that they covered every branch of the company's tracks and had to be run at an average speed of twenty miles an hour to keep up with the regular schedule time.

MOUNTAIN OF IRON

ONE of the wonders of Mexico is a great mountain of iron, situated at Durango. This mountain is about one mile long and from one-half to two-thirds of a mile wide. Its height ranges from 450 to 600 feet. It is estimated by engineers that it contains 350,000,000 tons of iron ore above ground. The ore averages 63 per cent iron and is of a quality well suited for the manufacture of steel. The ore is also used for fluxing by some of the smelters of Mexico. Mining the ore upon the mountain has been carried on at intervals for the last thirty years, and at one period in its history large works were established near its base for the purpose of utilizing the ore. This great iron mountain rises out of the level plateau upon which the city of Durango is situated and is an interesting feature of the landscape of that region.

THE TROLLEY FARMING SPECIAL.
Electric car used in agricultural extension work.

THE "OTTINO-WYLLIE" AEROPLANE

A NEW and curious flying machine, the invention of Messrs. G. P. Ottino and Algernon Wyllie, constituted a prominent feature at the last aeronautical exhibition in London. The general idea of this machine may be readily gathered from the illustration. Lifting and propelling action is secured by means of twenty-four planes mounted like a continuous belt on driving chains. The chains are driven by a motor mounted in the car of the machine and a single steering wheel adjusts the angles of the planes. In the illustration shown, the upper row of planes at an angle of ninety degrees to the lower row. When the planes are set at an angle of forty-five degrees to the driving chains, the whole serve to exert a direct lifting action. The aviator then gradually sets one row of planes at fifty degrees and the other at forty degrees to the driving chains, thereby bringing about a forward movement, and the speed increases as the angle of the forward propelling planes is gradually increased.

In addition to directly lifting a helicopter, the machine gives a backward movement without turning by the rudder.

SCRAPING OUT ZINC "SLUDGE."

NOVEL AEROPLANE.

ELECTRIC DOLL

A MECHANICAL doll with a circus in Berlin is causing a great sensation. The doll is operated by electricity and moves either fast or slow. It turns around, walks, kneels down, and makes many other movements seemingly impossible in an automaton. At the end of the performance a child of ten takes the place of the mannikin and the audience cannot detect the change. All who have seen this part of the performance have been deceived by it.

THE ELECTRICAL GIRL.

CLEANING A SLUDGE POND

IN the Joplin zinc mining district the ore is cleaned by washing. This operation requires more water than the mines will supply, and it is necessary to have a system by which the water may be saved and used again. A series of ponds is generally used for this purpose and as they in time become filled with silt, called "sludge," it is necessary to clean them out.

This is done by means of a sled which is made of boards. It is wider in front than at the back, which is closed by a removable gate. The sled is hauled through the pond with the end-gate closed, and collects the sludge which is removed when desired by lifting the end gate.

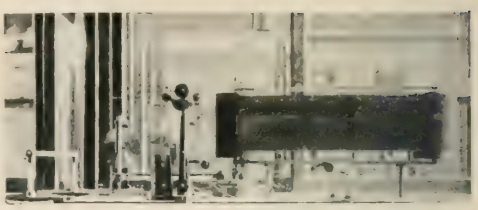
By this means the pond is rapidly cleaned without draining it.

MACHINE TELLS MAN'S POWER

STUDENTS of the University of Pennsylvania are enthusiastic over a remarkable machine that has just been installed, which determines the will power and working ability of each person using it. The hand is strapped at the wrist immoveably to a handle connected with the machine. The only part left free of action is the center finger. This works a lever that controls the

TESTING STUDENT'S ENDURANCE.

machine. By working the free finger up and down the machine is set in motion, and the pencil at the other end marks the force of the movement, as shown in one of the illustrations. At first the vigorous movement of the finger marks a broad stroke, as can be seen by reference to the picture. As the force of the finger weakens the strokes of the pencil get narrower until they make a mere dot and at last cease altogether as the will power of the operator gives out. The



MACHINE FOR TESTING WILL POWER.

students are vieing with each other to get the best chart. Each man's effort is charted by the university and competition is keen to get the best chart.

SIMPLE LIFE IN TURKEY

THIS curious photograph was received from one of our consuls, stationed at a Turkish seaport, only the other day. It represents the outdoor sleeping place of a Turkish gentleman on the southern coast of Asia Minor, near Adalia.

The consul, who sent the picture to the government Bureau of Manufactures at Washington, did not explain whether the occupant of the sleeping place used it merely for health purposes or as an agreeable substitute for a bungalow in the summer time. One notices, however, that the affair consists of a rude platform built under a small tree, for the sake of shade, and that the bed is surrounded by a sheet of canvas. The proprietor is evidently enjoying a cup of tea in company with some friends who are paying him a visit.

OUT-DOOR BEDROOM IN TURKEY.
Probably will not be widely adopted in America.

PLACING THE CONCRETE.

REINFORCED CONCRETE AND THE CATHEDRAL AT RHEIMS

THE façade of the magnificent cathedral at Rheims with its mighty rose window, flanked with pointed openings, crowned with carved tabernacle work, is perhaps the most elaborate to be found in France.

This part of the cathedral has been in an alarming condition, and threatened to fall at any time. The rose window was curving outward, the great pediment which terminates the gallery of the Gloria between the two towers was leaning towards the porch to such an extent, that from the ornament crowning the summit of the triangle to the base of the balustrade the incline was more than a yard.

THE REINFORCEMENT IN PLACE.

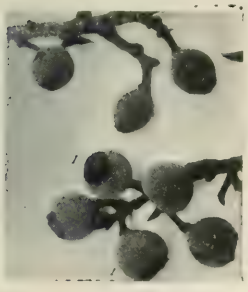
At three-fourths of an inch above the keystone of the great rose there is an arch which was not well established and it was pushing against the towers.

The architect who had charge of restoring the cathedral, conceived the plan of setting an enormous strengthening beam of reinforced concrete, which would sustain the gable and make a bond for the towers.

ROSE WINDOW OF THE CATHEDRAL AT RHEIMS.

QUEER WAY TO RIPEN FIGS

THE Arabs of Biskra and Egypt have an odd way of helping figs to ripen. They cut off the tips of the unripe figs; and, within three days after this is done, the figs thus treated become twice as large as those which have not been cut. In addition, they develop a much better flavor and command a much higher price in the market. In the accompanying photograph, the two figs marked "I" have had their tips amputated in the manner described.



FIGS RIPENED BY CLIPPING.

PORTABLE PICTURE TELEGRAPH

A REMARKABLE development has been accomplished in connection with the telegraphing of pictures. Hitherto such work has been confined to certain newspapers possessed of the requisite financial ability and enterprise to indulge in expensive and deeply scientific devices of a delicate character, necessitating the services of a skilled operator. Now, however, it is possible for anyone to possess a picture telegraphing apparatus and thus secure quickly pictorial illustrations of far-off scenes.

This invention has been perfected by Mr. T. Thorne-Baker whose telectrograph has superseded the Korn apparatus for the transmission of pictures between London and Paris or Manchester for the *Daily Mirror* of London. It is a simplified modification of the telectrograph, great ingenuity having been displayed in its design and operation so as to render it workable by any one. It is completely

PICTURE TELEGRAPH APPARATUS.

self-contained, and occupies no more space, nor weighs more, than a typewriter. Closed, and with a strap, it can be carried over the shoulder as if it were an ordinary camera.

The single apparatus can be used both as a transmitter and receiver. There is the revolving drum over which the stylo moves, transmitting and receiving the varied tones and shades constituting detail which builds up the desired image in a multitude of lines. The apparatus works at high speed and a picture can be transmitted over two or three hundred miles of line in a few minutes.

Moreover, in order to meet special requirements the inventor has adapted it to work in connection with wireless telegraphy. In this case the picture is reproduced in broad outline by means of closely following dots. In this phase, tone, light and shade are not essential, a bare skeleton sufficing. This application is especially useful for military and naval purposes. A plan can be secured by photography, and within a few minutes by coupling up with the wireless, an outline of the drawing of the position can be in the hands of the general.

The apparatus is similarly within the reach of private residents and commercial houses and should be useful for transmitting diagrams, sketches and drawings which have hitherto had to be mailed or sent by train. It is only necessary to call up the number required on the telephone line and request the coupling up with the wire of the receiver, and the pictorial message can be quickly transmitted, thereby saving several hours of possibly valuable time.

NICOBAR IMAGE OF MISSIONARY.

NICOBAR IDEA OF AN ANGEL.

TREE GROWS AROUND A HOLE.

WOODEN ANGELS

IN the midst of the Bay of Bengal is a little-known group of islands called the Nicobars. It is inhabited by a half-savage people who have an extraordinary taste for image-making. They make images of everything imaginable, carving them out of wood, and utilizing them as fetiches to keep off bad luck and evil spirits. For this purpose they hang them up in their houses, and sometimes the rafters are fairly crowded with the wooden images.

Missionaries have made these people at least nominal converts to Christianity. They did their best for quite a while to discourage the business of manufacturing "idols"—regarding the images as corresponding to that description more or less. But the natives refuse to be broken of the habit; and, without intending any irreverance, they have not hesitated to produce carven representations of angels, and of the missionaries themselves, the latter being appropriately adorned with "stovepipe" hats.

FREAK TREE

THE freak tree shown in this picture is a blue gum, (eucalyptus globulus) growing in a western park. Two of the main branches unite, forming a circular opening. In the picture the hand of a child may be seen in this natural frame.

UNIQUE SHIP'S TELESCOPE.

SHIP'S TELESCOPE

THE telescope illustrated here is for use on shipboard. The officer operating it holds the handles in his hands firmly, and rests his chest in the contrivance placed just above for that purpose. Thus, no matter how much the ship may be pitching and rolling, he is able to keep the instrument pointed with reasonable steadiness at the object in view.

LEAD PIPE CUT BY A RAT IN ONE NIGHT.

CANAL LOCK AS FISH TRAP

ONE of the most curious fishing nets in the world is in operation at Delaware City every Saturday night. It is used at no other time than between midnight of Saturday and midnight Sunday. The reason for this limitation in the working time is that the fish can only be caught at these hours. The net is the lock that connects the Delaware and Chesapeake Canal with the Delaware River. A rule of the canal is that the lock shall remain closed on Sunday. The lock keeper therefore closes his gates at 12 o'clock Saturday night and reopens them at 12 o'clock Sunday night.

This is the lock keeper's harvest time. When he closes his locks for the night he arranges the gates so that a small flow of water continues to run from the fresh water of the canal to the salt water of the Delaware. The fish are swarming up the river looking for fresh water in which to spawn and they are attracted to the supply that flows from the canal into the partly closed lock. All that the lock keeper requires for fishing gear is a dip net. He leans over and dips up the fish as fast as he can let down the net. On Saturday night the residents come from miles around to purchase the fish caught in this way. It is the easiest and most profitable fishing in any part of the country.

WHAT A RAT DID

THE illustration herewith shows plainer than words can depict what a rat can accomplish with patient appli-

CANAL LOCK CATCHES FISH.
Lock between Delaware River and the Chesapeake and Delaware Canal.

cation of its chisel-like teeth. The entire cutting on the section of lead water pipe shown was done by one rat in a single night. A recent flood in the Ohio River drove the big, gray river rats from its shores and retaining walls through sewers to the stores and residences of Middleport, Ohio.

The morning after the flood had reached its highest point, a stream of water broke through the ceiling of a meat shop in that town from a residence above. A hurried investigation showed that a rat had gnawed away more than half of a two inch lead pipe leading to a sink above. The cuttings were left on the ceiling where the rat had firm footing and a good place to work. Evidently the rat was after the grease lining the inside of the pipe. To reach that it was but necessary to cut a small hole in the pipe. Why did the rat go on and cut the pipe more than half in two and for several inches up and down?

A careful examination of the section of damaged pipe shows conclusively that the rat went at the job in a workmanlike way. After cutting a hole through to the cavity, it cut from each side with upward strokes from the lower jaw, each stroke of the sharp teeth leaving distinct marks.

ELECTRIC WINCH.
Used in coaling war ships.

AN ELECTRIC PULLEY

THE "power pulley" is an electrically operated winch recently designed by the Siemens-Schuckert Works to enable quick coaling of warships. Apart from its original destination it may, however, be used for a multitude of other purposes both on land and on board ship.

This pulley is designed for a load of 60 pounds at a lifting speed of 6 feet per second. Four seconds are thus required for lifting the whole basket to a height of 23 feet (taking into account the acceleration in starting and the slackening in stopping). The motor is sufficiently strong to stand temporary overloads of up to 100 pounds.

Apart from its simplicity in operation, and high working speed, the power pulley is especially valuable because of its ease of transport, the more so as on the modern ships of the Dreadnought type the deck should be cleared as far as possible for military operations.

The motor is started by a simple switch without a starting box. A simple device allows the hook when empty to be lowered as far as desired, so that packages at any depth may be reached.

WAR AND WOMAN.
British women-army nurses parading with their ambulance wagons.

BRENNAN'S MODEL MONORAIL CAR.
In the center of 50-foot span of cable.

GYROSCOPE WORKS WONDERS

By

ARTHUR B. REEVE

A TOY vender stood on the curb of the shopping district and shouted. In a moment the crowd gathered eagerly and open-eyed about him. He picked up a little cubical pasteboard box and stood it on the point of a pencil—and it stayed there. Next he caught it up by a loop of thread and it stood out horizontally without support, ostentatiously defying the law of gravitation. Then he performed his most fetching miracle. He set it on an inclined wire and down it went, preserving its balance with great dignity. Then he opened the box and displayed its contents.

"Fifteen cents, ladies and gents. Step up and buy your gyroscope tops—three nickels, fifteen cents." And the crowd bought. For there is something irresistibly fascinating about the gyroscope top.

So a Connecticut Yankee of ingenious mind thinks, and he is solving the problem of safe flight in the air. So a little Irishman in England and a learned, practical German savant have thought, too. The result of their work and the work of many others is the coming age, the age of the gyroscope, when by the aid of this marvelous little instrument we shall fly safely in the air, spin over the earth on a single rail—perhaps on a single, big wheel—sail the seas without rolling or pitching, dive down unafraid among the fishes, revolutionize war, annihilate space,—in short do a thousand things of which we have only now just begun to dream, all by means of another little toy that has been made to do the world's work.

GYROSCOPE WHICH AUTOMATICALLY BALANCES AN AEROPLANE.

Stanley Y. Beach has just constructed and patented an aeroplane with a gyroscopic attachment to insure perfect, automatic stability. Ten thousand whirls a minute of his gyroscope wheel, he claims, will keep his areo steady as a bird. The little gyrostat will be the brains of the big mechanical flyer.

The machine on which Mr. Beach is at work is built after the one used by Bleriot in crossing the English Channel.

Revolving in a vacuum, the gyroscope will continue of its own momentum for hours, so that in case of an accidental breakdown or stopping of the motor it will keep the car perfectly steady as it descends.

"The gyroscope eliminates all worry about stability," says Mr. Beach. "It will keep the machine absolutely steady in the face of currents, eddies, and sudden winds, and will make the driving of the aeroplane as simple and easy as the steering of an automobile.

CAPTAIN MAITLAND IN HIS VOISIN BIPLANE.
Gyroscope mounted at upper left.

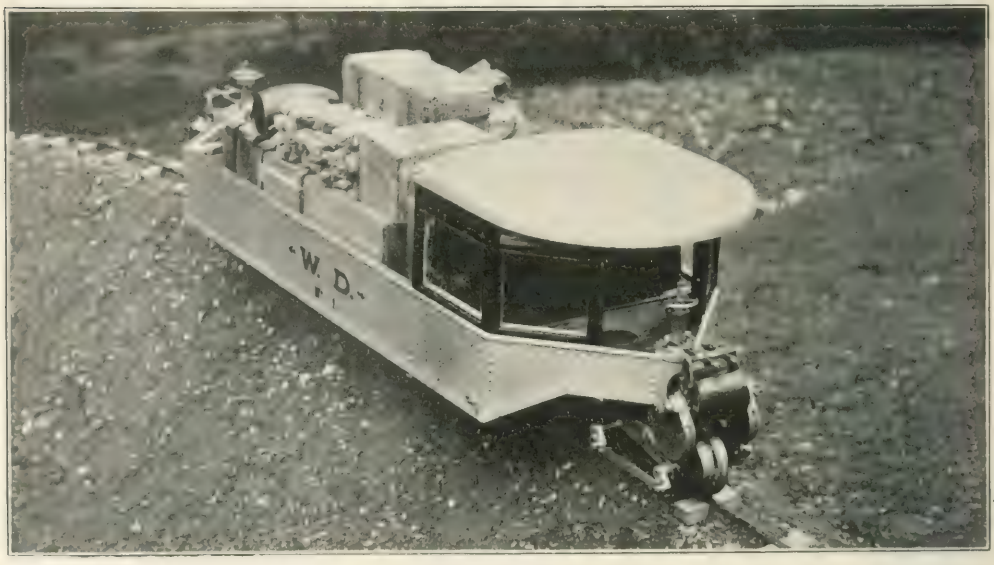
"I believe that the application of the gyroscope principle to aeroplanes is the long-sought solution of the problem of aerial navigation. It will meet every change in air currents, the slightest as well as the greatest, resisting each with the exact force necessary to balance it, and accomplishing all this automatically without the slighest thought or worry from the steersman."

Mr. Beach is not the only American who is working out the problem of applying the gyroscope to flying machines.

"This is a gyroscope for a flying machine," said a young engineer, as we threaded our way gingerly among the whirling belts of a machine shop overlooking the Brooklyn Bridge. He picked up a curiously encased arrangement about eighteen inches high and perhaps as much in diameter. Though it appeared to be only a plain piece of metal, from the outside, it covered a heavy little flywheel inside, so arranged that by means of rings fitting in gimbals the wheel itself was free to move in any plane whatever. It looked pretty heavy for an aeroplane.

"Lift it," said the engineer. I did so and was surprised at its real lightness.

"You see the case is made of aluminum so as to be as light as possible, yet strong," he said. "It weighs under thirty pounds.



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Technical World Magazine

HENRY M. HYDE, Editor

Contents for October, 1910

Cover Design — Fred. Stearns

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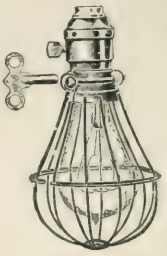

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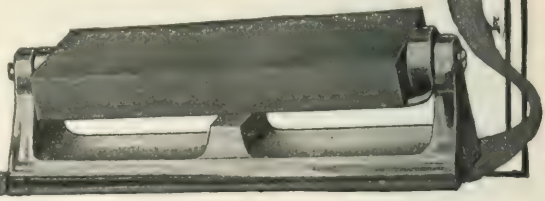

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OCTOBER

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THE NIAGARA OF AFRICA.
Victoria Falls in the Zambesi River, Rhodesia, Africa.

(See page 177.)

THE TECHNICAL WORLD MAGAZINE

VOL. XIV OCTOBER, 1910 NO. 2

PEOPLE WHO DWELL IN THE DARK

By

BAILEY MILLARD

"LET in the light!" is the slogan of the men and women engaged in tenement-house reform in New York. It is hard to believe, but it is nevertheless a fact, that on February 13, 1903, there were in that city 101,277 absolutely windowless rooms, most of them bedrooms, inhabited by the poorer classes, those who pay rent of three to sixteen dollars a month.

Because of the strenuous efforts of the Tenement House Committee of the Charity Organization Society in securing and enforcing the tenement house law, the number of windowless rooms has been reduced to about 90,000.

Think of it, you dwellers in spacious, sunny suburban villas—ninety-thousand rooms without any sunlight, whatsoever, save that which enters by the door that admits the person who goes into it to eat, to sleep, to work, or to sit about and enjoy himself as best he can!

Some of these ninety thousand rooms are in cellars, some in attics, and others are distributed about on intermediate floors, according to the fearful and wonderful designs of that most hopeless of all human habitations, the dumb-bell or double-deck tenement house.

Most hopeless? Yes, because the man who lives in a cave can at least enjoy privacy and silence and air that is not contaminated by the exhalations and nuisances of his fellows; the man who lives in a tent can pull back the flap and get air; and the man who lives in an igloo can cut as many vents in its walls as he chooses and have as much light and air as he wants and at any time that he wants it. To the majority of tenement dwellers fresh air is scarcely anything more than a myth.

We are wont to think of London as a city where miserable millions are crowded into uncouth and unsanitary quarters, but London's greatest density of population is less than six hundred to the acre, while in New York there are blocks and blocks where the density is one thousand to fifteen hundred human beings in that space.

In Chicago, the number of people in the Polish quarter, according to Robert Hunter's report, is three times that of the most crowded portions of Tokio, Calcutta, or of other Asiatic cities, where, we have always been taught, the population is appallingly congested, and yet the density rarely reaches five hundred to the acre, or only one-third to one-half that of New York's packed-in population.

Both New York and Chicago have far worse tenement-house conditions than

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A DARK LIVING ROOM IN BROOKLYN.

London, the worst congested city in Europe. While each of these American cities still permits the building of the deadly double-decker, which in New York is more often the sextuple-decker, allowing a density of thirteen hundred people to the acre, with rooms as small as seven by ten feet in size, London is insisting upon model tenements such as the Waterlow Buildings, which house thirty thousand people, among whom the annual death rate is but ten to the thousand.

With all the efforts to reform the New York tenements and to let in the light, the death rate in some of the more congested blocks is over one-half higher than that of the city as a whole, or about twenty-five to the thousand—two and one-half times that of the model London tenements.

The death rate per thousand in New York as a whole in 1908 was 16.5, in Chicago 14.1, in London 13.8. But these figures double themselves in densely populated quarters, as it is a well-established fact that the greater the overcrowding the higher the death rate.

Nearly every large city in America has what is called its "housing problem." For a particularly large city, Philadelphia has less tenement-house trouble than any other city in the country, for there the dumb-bell tenement is practically unknown. The city prides itself upon its neat rows of workingmen's cottages, its low buildings and the consequent small density of population to the acre and comparative freedom from the evils of insufficient light and ventilation that are the curse of other large cities.

But not in Baltimore, not in St. Louis, not in Cincinnati, not, as we have seen, in Chicago, not in any other American city, save Boston, is there anything that approximates the frightful state of affairs that one finds in New York, and in Boston the bad state of the tenements is not so much due to tall tenement buildings as to the filth and general unsanitary conditions that have been permitted in all classes of tenements, resulting in a death rate as high as 19.1 to the thousand.

But now as to the New York people who live in the dark—those who occupy the ninety thousand absolutely windowless rooms and the hundreds of thou-

sands of rooms that are "lighted" by windows opening into other rooms that front upon gloomy little air shafts—what of them? Well, most of them are of the factory-working class who receive from $6 to $12 a week. They are poorly clothed, miserably fed and they pay, in proportion to the accommodations they receive, the highest rent of any people on the face of the globe.

This rent is the heaviest tax upon their earnings. Its high cost is the direct result of the excessive price of the land, caused by the shape and situation of Manhattan Island, the city proper, and the extravagant type of house which has resulted from the shape and size of the lot, nearly always twenty-five by one hundred feet.

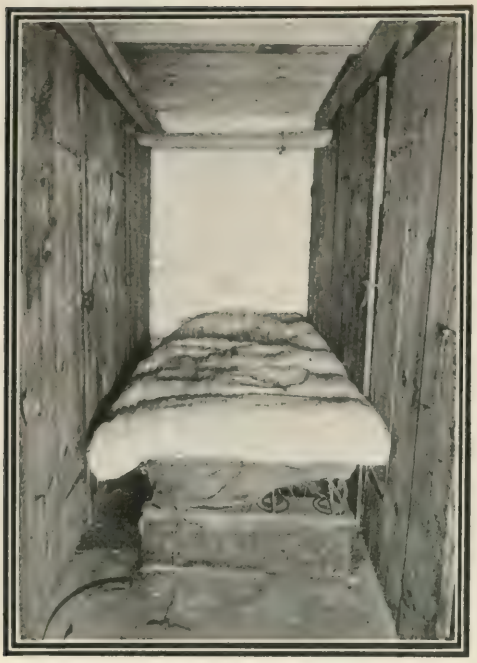
Ernest Flagg, the well-known New York architect, declares that the division of blocks into lots of this size was the greatest evil that ever befell New York, and that "no other disaster can for a moment be compared with it." Sharply critical words that are to the point.

One cannot build a house six stories in height on a lot twenty-five by one hundred feet and make that house habitable without sacrificing valuable ground space, and this the landlords have always refused to do. It works out in this way: In the building up of a block of such houses after the detestable dumb-bell plan, each house to accommodate four families to the floor, the ideal number from the landlord's point of view,—there would be twenty families in each building and 768 families in the block.

But floors intended for four families are often made to accommodate five to seven, hence the frightful congestion against which no effort of the reformers seem to avail. Such houses are found on "San Juan Hill" and in other parts of the city, and when one enters one of them one finds unspeakable conditions, the worst of which, from a purely sanitary viewpoint, is the absence of light. For sunlight, the radiant energy upon which mankind exists, is the greatest of all microbicides. In the dark the germs of diseases are quickly hatched and quickly spread.

About the landlords? Well, they are, indeed, a craven lot, taking them as a whole, though here and there you will find a self-respecting one. To character-

CELLAR DORMITORY IN THE REAR OF A BAKERY.



No Sunlight Ever Penetrates This Underground Bedroom.

ize them adequately as a class would require a fine mastery of adjectives. For dark iniquity, for consummate greed, for unspeakable mendacity, for criminal defiance of the law, you will search the length and breadth of the land to find the equal of the New York tenement-house owner at his worst, and at his best he is none too good.

The reason why there still remain in that city ninety thousand windowless rooms is not because the Tenement House Commission has not done its duty in trying to make the landlords comply with the law which requires that every room shall have at least one window three by five feet in size. All the owners of such houses have been ordered to put in the windows, but they have made every excuse they could think of to cloak their non-compliance with the law or to defer the work and the incidental expense, which, in some cases, would be slight. Not only that, but they have banded together to set at naught the provisions of the law or to introduce new, or retroactive, and, in all cases, abominable legislation.

This concerted action has not been merely with respect to the lighting of dark rooms, but to all other tenement-house reforms.

"Every year, the Tenement House Committee," as it states in its report, "has been obliged to oppose objectionable housing bills. During the last session of the legislature twenty-five different measures amending the tenement-house law were introduced. The committee, with the co-operation of various organizations interested in tenement house conditions, succeeded, as in previous years, in preventing the enactment of any dangerous tenement-house legislation."

"Two bills will serve as examples of measures defeated. One of these would have permitted dangerous bakeries in tenement houses without adequate fire protection, and would even have allowed communications from bakerooms to the public halls and stairways used by all

A Sleeping Room Under the Sidewalk.

the tenants in the houses. . . . The other measure would have granted discretionary power to the Tenement House Commissioner and his deputies and superintendents to depart from the requirements of the law respecting alterations to existing houses. The obvious aim of this measure was to open the way to owners for the evasion of the present provisions requiring structural changes in the old houses. If this bill had become a law, it probably would have resulted in stopping the work of lighting and ventilating the dark interior rooms, of providing skylights for halls, and of removing the sinks."

Those who own cellar apartments will not keep them in repair, relying upon the tendency to neglect of such places by inspectors, who naturally prefer to keep out of them. Often the floors are damp or flooded with water, and the landlords rely upon the tenants to pump them out and keep them habitable.

In one house in Mott street the inspectors for the Tenement House Committee recently found a family of eight persons, father, mother, two sons, and four daughters, living in a cellar "apartment" consisting of three rooms, two of which had no light save that which straggled in from open doors from the front room under the sidewalk, lighted by a dozen or so dirty little disks of glass upon which the feet of the street pedestrians were constantly pounding. The apartment was crowded with old broken-down furniture, and the front room, in which were two beds, was strewn with scraps of leather, for the father of the family was a shoemaker. These dwellers in the dark had lived—existed were the better word—in this place for three years, and their pale, pinched features attested to the absence of sunlight in their daily life. The shoemaker, it was learned, rarely stirred out of the place, except of an evening when he went to a corner saloon. The curious part of the whole matter was that the family did not seem to be unhappy. The mother assured the inspectors that the cellar had its advantages over a third-story flat in which they had lived formerly, as it was cooler in summer and warmer in winter!

Often the inspectors find regular cellar dormitories, occupied by scores of persons. One such place was in the rear of a bakery on East Fifty-seventh street. In a long, low room, lighted only by a doorway leading into the mixing-room of the bakery, were found a dozen beds each occupied by two tired men, fast asleep at noon. These men, who be-

A Seven by Twelve Foot Cellar Bedroom Used by Man and Wife

CELLAR APARTMENT IN MOTT STREET, MANHATTAN.

longed to the large class of night-workers, rarely saw the light of day save for an hour or two of a late summer afternoon. Most of them were brawny and fairly well-fed, but their faces were tallowy and their eyes had the staring expression of owls.

A cellar bedroom only five by ten feet in size, occupied by two factory workers, a man and his wife, was found on Lexington avenue. The only strong light that ever entered the room was that of the flashlight of the photographer who took the bare, sorry picture of this underground kennel.

It is not in Manhattan alone in which these miserable conditions are found. You will find them in the Bronx, in Brooklyn and even in Richmond, on Staten Island, where there is room enough and good sea air enough for the whole population of Greater New York. In a Brooklyn cellar a man's mattress was found supported by barrels in a room so dark that it was impossible to see the hand before the face.

But it is just as dark and almost as unsanitary in many of the upstairs rooms of the tenements as it is in the cellars. The halls in all the houses are more or less dark, even during the brightest part of the day, and in many cases the insistence of the Tenement House Commission upon the putting in of a three by five window and the grudging compliance of the landlord to this demand works no real reform of the evil in respect to sunless bedrooms save that it gives a little more air—air of the heavy, noisome variety found in such houses.

"When groping my way in the passages," says a frequent visitor to the tenements, "I usually imitate the steam craft in a thick fog and give a danger signal when I hear some one approaching; and even when all is silent I proceed with caution, for more than once I have stumbled against a baby that was quietly sitting in the dark hall or on the stairs."

In none of the old-style halls is there any way of getting light and air except from the skylight in the roof or from the glass transoms in the doors of the rooms. In the newer houses a scanty supply of air comes directly from the air shaft at the side of the hall. But the new houses are not much better

lighted than the old ones, save in those cases where the provisions of the tenement-house law have actually been complied with.

In the older houses the sink is generally found in the hall, where the four families living on the same floor get their water. These sinks in the halls are a menace to health, as they are often filthy, and a person is always likely to stumble against them in the dark.

Aside from the darkness in which disease germs thrive apace, there is often found in the bedrooms and living rooms the utmost confusion of household goods and wearing apparel, mingled with rank filth and odorous obscurity. The Board of Health is constantly fighting these conditions, but in such a vast jungle of poverty and squalor as New York, twenty boards of health hardly could enforce sanitary regulations.

"Little Italy" is one of the worst congested spots in Manhattan, and here the people who dwell in the dark are found in greatest number. In some places there is such a crowding-in of families as to suggest a great hive, though none of the cleanliness of the bee is found there. In a small room off an image-making shop on Avenue C are six bunks, in two tiers, where the tired plaster-workers seek repose. Little attention is anywhere paid in the Italian Quarter to the municipal ordinance permitting but one adult and one minor under twelve to occupy a room seven by ten feet, or six hundred cubic feet in size. Such rooms are often found to contain from three to five persons. This saves rent money, but it does not save doctor's bills, and is generally found to be poor economy, though it is largely practiced in darkest New York.

In some already overcrowded rooms the tenements take lodgers and thus help to pay rent. It is this everlasting problem of rent, rent, rent that leads to dwelling in darkness and to packing people in like sardines in a can. Rent is the thought always uppermost in the poor tenant's mind. One tenement-house dweller told me his idea of heaven was a place where nobody paid rent. Of course

HOW THEY STACK UP IN THE ITALIAN QUARTER.

he could get out in the free open air and sunshine of the country, and pay less than half the rent he pays in the crowded metropolis, but that wouldn't suit him—too far from the Bowery. In nearly every case where philanthropic persons or organizations have sent poor Manhattanites to the country to work upon farms they have found their way back to the stinks and the darkness of the city. They seem to believe that the thick air of the tenements is nourishing to their systems, and their souls yearn for it as pants the hart for cooling streams.

Darkness and sin have much in common, and it is certain that the dark halls and crowded rooms are anything but favorable to virtue. There is little fastidiousness and few rules of etiquette and propriety in most of the tenements,

How the Light Is Let in by the Tenement House Commission.

Passageway and Sink in Cellar Apartment.

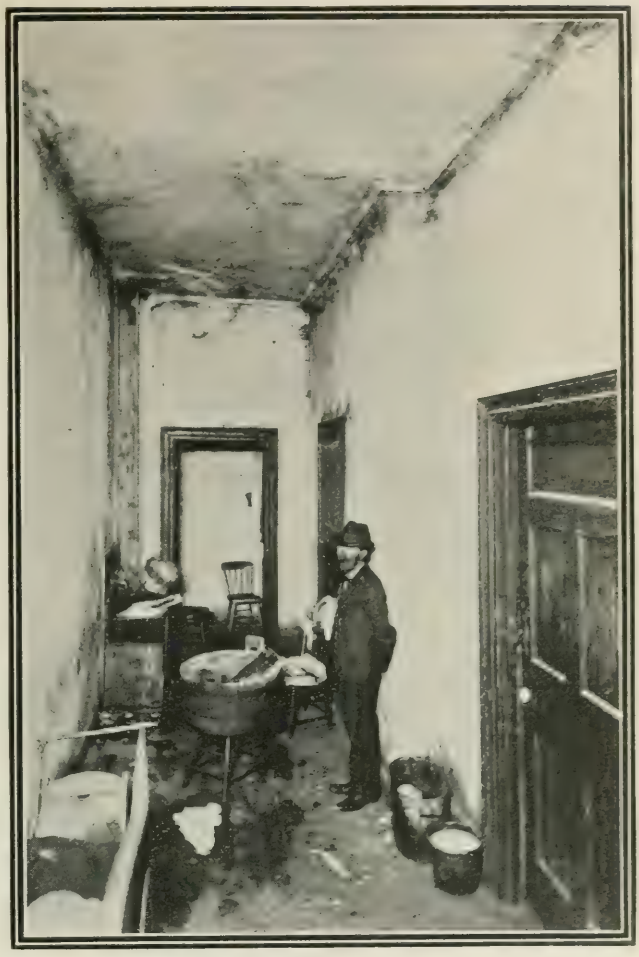
and many a daughter of a family living there has had cause to regret her life of mixed social relations. But the great majority of young women take the results of this life stoically. It is the hardening process of dwelling in the dark that is worst of all—the lack of those sensibilities that make for higher humanity.

Extravagance plays a great part in keeping these people in the dark. Rarely do they save any money. When the monthly rent and grocery bills of a young married couple are paid, the wife goes out to buy some finery that she cannot afford or to purchase some article of furniture on the installment plan, the dearest way to buy anything.

Although hundreds of new tenements are being built every year in New

York, it is often hard for a poor man with a large family to find a place for them to live. Even in the poorer tenements the question is always asked "How many children have you?" High rent is often exacted for miserable rooms because there are six or seven children in the family.

But in the cellars everything goes, children, rats, goats, and even pigs. On February 13, 1909, there were in greater New York 24,448 underground living rooms! These cellar habitations are evolving a gnomic race that is physically inferior to even the common run of mankind as found in great cities. The children are often large-eyed, ghastly pale, and thousands of them are afflicted with tubercular complaints. There is a frightful mortality from measles, scarlet fever, whooping cough, and diarrheal diseases. The death rate from measles in the tenement is said to be five to six times as great as it is in the city as a whole. Cellar living adds frightfully to all classes of preventable diseases. The deaths from these alone in New York are about 27,000 annually, and there are 24,000 new cases of consumption every year.



A Windowless Hall and a Consumptive Tenant

Verily the people who dwell in the dark are a pitiable race, but many of them are there through their own fault, and, as it would seem in countless cases, by their own preference; and though commissions may try to better their condition by putting in a window here and there or cleaning up a basement, and charitable folk may send them their cast-off clothing, nobody really can help them but themselves, and this they must be shown.

REFORMING THE BAD SEASONS

By

CARL CROW

THE wrinkled old farmer looked anxiously around at the sky line marked by green corn stalks in sharp contrast against the blue of the sky. Nowhere was a suggestion of a cloud to be seen. The ground beneath his feet was dry and cracked from the long drought.

"The corn'll not hold out much longer," he said to his wife. "A few days of these hot winds and it'll be burned up. A good rain now would save it."

Already the long leaves on the corn stalks were beginning to curl up around the edges and the color changed from a glossy green to a duller hue. The leaves had begun to rattle against each other like dead things when the wind blew—a wind menacing with blasts of hot air and without a promise of moisture. That day and many days that followed passed without rain and when finally the welcome downpour actually did come the corn was past its help.

The farm, which should have produced three hundred bushels of corn fell short of that amount just fifty per cent. As a result Farmer Perkins did not have enough feed to keep his stock through the winter and sold off some of his brood mares and a couple of calves. The market was not good when these forced sales were made and he sold, at a loss, to a neighbor who had plenty of feed and a talent for trading. The poor crop was an especial disappointment because the Perkins barn had been running down for years and had to be rebuilt. By mortgaging the place he managed to pull through the winter, but the year's hard work resulted in no profit and Mr. Perkins is discontented and discouraged. He is talking of selling out and moving to the Southwest or the Northwest or some other place, where, he has heard, the odds against which

SHOWING POSSIBILITIES OF CORN IN A COTTON AND SUGAR COUNTRY, LOUISIANA.

the farmer works are not so large as where he at present lives.

With Mr. Perkins, who is representative of the average American farmer, a bet on nature. If the rains are right, he wins; if wrong, he loses. Often the rains are wrong and then the whittling committee at the cross-roads store re-

KAFFIR CORN IN OKLAHOMA

the crop barometer goes up and down with the seasons. When a good crop is harvested, the season has been good; when the crop is poor the season has been bad. Each spring when he plows his field and plants his corn, he is laying

turns a bitter indictment against farming, and the farm boy decides to take the first opportunity to attach his name to a town payroll.

"No farming for mine," flippantly remarks young Henry Perkins, who is

now delivering groceries at $12 a week. "Pa has worked on the farm all his life and he's got nothing now but a crop of mortgages. On the farm it's get up at five o'clock every morning and work hard all day behind a pair of contrary mules and maybe you won't get enough corn to feed the mules through the winter. I drag down my little $12 every week and I don't have to worry about

form of home mission work which already has many converts and under the direction of the United States Department of Agriculture its pioneers are pushing far out on the frontier of ignorant and haphazard farming. At a small cost they are making good farmers out of poor ones, thereby increasing the winter supply in our national smokehouse.

TEXAS COTTON READY FOR SHIPMENT.

the drought which may come next season."

In these remarks Henry has summed up the principal reason why we have so many barbers and teamsters and so few farmers. If all the seasons were good, there would be no "back to the farm" movement. Most of us would be there now, proprietors of automobiles and stockholders in the local bank. It is the bad season that cuts down the crop totals and puts dollars to drawing interest on farm mortgages.

Therefore—reform the bad seasons and all will be as happy as a melodrama with the villain safely impaled on the hero's penknife. Then will the golden harvest be golden indeed, and from the American farms will come the foodstuffs to feed the world. This is a practical

Let us return for a moment to Mr. Perkins and his poor corn crop. Mr. Perkins' knowledge of farming was gained from his father, to whom this knowledge was imparted by Grandfather Perkins and thence we might trace the knowledge back through preceding generations until we find the original Perkins on the fields of Angleland showing his firstborn how to guide the wooden plowshare. We would find little difference between the methods of cultivation then and now. The present Perkins, worrying over his poor prospects and hoping for rain, plows and plants and harvests in much the same way that the first plowing and planting and harvesting was done. His methods he defends because of their antiquity and his own vast ignorance of the mysterious forces

of nature which transform a grain of corn into a towering stalk.

So far as his understanding of the thing goes, it might be the old army game in which the operator urges: "If you never risk you never will accumulate." Mr. Perkins risks and then trusts to the whims of the season to allow him to accumulate a crop. He is playing the game like his father played it and beneath the three shells of Seed, Soil and Season, hopes to discover the golden harvest.

Into this old fatalistic idea of farming come the experimenting optimists of the United States Department of Agriculture with the idea that seasons are relatively unimportant. Nature is bountiful, but the age when she acted as a fairy godmother to infant humanity disappeared with the lost tribes of Israel and now the treasures must be looked for with the test tube and the experiment field. It is not enough to plow and plant. There are ways of plowing and ways of planting and the big returns follow the best methods.

FIELD OF CORN ON SAN ANTONIO EXPERIMENT STATION.
This corn was fallow the year before.

Pursuing this idea, the investigators have discovered a few of the simple and practical methods and have demonstrated that a corn field which produces twenty bushels to the acre under ordinary methods will produce twenty-five bushels with careful selection of seed. By improved methods of preparing the soil, the yield can be increased to thirty bushels. The correct use of fertilizer or a good crop rotation system will add another five bushels to the yield, and a scientific method of cultivation will bring the product up to forty bushels, thereby accomplishing the important economic feat of placing two corn pones in the oven where only one baked before.

They have made farming a business in which the profits can be forecast with as much accuracy as in any other business. It is their belief that the season, as an unavoidable factor in farming, is a myth, just like the aged idea that potatoes, having eyes, should be planted in the dark of the moon so that no light would lure them above the ground to waste their strength on a luxuriant growth of valueless vines. They have proved that the inherited depravity of seed and soil and season can be overcome and that the bad season is a condition of farming exactly to the same extent as it is a condition of the weather.

FIELD OF DURANGO COTTON.
A fine growth under proper cultivation.

To this work several hundred missionaries of the Department of Agriculture are devoting themselves. For years the government has aided in the maintenance of experiment stations in every state, but the new missionary campaign carries the instruction into the homes of the farmers themselves. The tests and demonstrations are carried on, not on government land, but on the land of the farmer and the work is done by him, under the direction of the government agent.

The missionary campaign centers in the south central states, where it is most

needed, and in a hundred communities a miracle of transformation has been worked, not only in the production of better crops, but in the optimism that follows. The movement in each community usually starts with a school house meeting championed by the commercial club or the progressive business men from the county seat. The importance of better farming methods is discussed and the plan for the establishment of experiment tracts to be cultivated under the supervision of government experts is told of. The farmers are urged to devote from one to five acres for this purpose. They are asked to take nothing for granted, to believe nothing that they do not see, and to follow only the methods which through their own work on the experimental tract prove successful. Throughout the season these experimental tracts are visited by the department agent who gives expert instruction as to the cultivation of the crops.

Scenes in a Farmer's Experimental Fields.
In one county in Texas the increased value of the cotton crop alone amounted to $748,000.

Sometimes the farmers of a community meet him at one of the demonstration farms or at a general meeting held at the school house. Here the farm missionaries borrow an idea from the revival meetings of the country districts, and the exhorting talk of the lecturer is followed by an experience meeting, in which those who have been converted from the dark belief of haphazard farming to the true light of scientific agriculture tell of their change of faith and the attendant result that have rewarded them.

At a recent meeting of this kind in Alabama a lanky cotton planter arose to say: "I was born in a cotton field and have worked cotton on my farm for more than forty years. I thought no one could tell me anything about rasing cotton. I had usually raised one-half a bale on my thin soil and I thought that was all the cotton there was in it in one season. The demonstration agent came along and wanted me to try his plan on two acres. Not to be contrary I agreed, but I did not believe what he told me. However I tried my best to do as he said, and at the end of the year I had a bale and a half to the acre on the two acres I had worked his way and a little over a third of a bale on the land I had worked my way. You could have knocked me down with a feather. This year I have a bale and a half to the acre on my whole farm. As a cotton planter I am just one year old."

Every meeting of this kind brings out experiences and some of the scoffing non-believers are converted.

The field instruction given the farmers is based on the ten commandments of the Department of Agriculture, which are as follows:

I. Prepare a deep and thoroughly pulverized seed bed, well drained. Break in the fall to a depth of eight, ten, or twelve inches, according to the soil, with implements that will not bring too much

of the subsoil to the surface. The foregoing depths should be reached gradually.

II. Use seed of the best variety, intelligently selected and carefully stored.

III. In cultivated crops, give the rows and the plants in the rows a space suited to the plant, the soil, and the climate.

IV. Use intensive tillage during the growing period of the crops.

V. Secure a high content of humus in the soil by the use of legumes, barnyard manure, farm refuse, and commercial fertilizer.

VI. Carry out a systematic crop rotation with a winter cover crop.

VII. Accomplish more work in a day by using more horse-power and better implements.

VIII. Increase the farm stock to the extent of utilizing all the waste products and idle lands of the farm.

IX. Produce all the food required for men and animals on the farm.

X. Keep an account of each farm product in order to know from which the gain or loss arises.

To the fickleness of the gentle rainfall, the farmer is usually able to charge all his crop failures. If it could only be regulated to fall at the time and in the quantity needed by Mr. Perkins' corn crop, we would raise five billion bushels each year instead of two and a half billion. As a matter of fact, the total annual rainfall in any locality does not vary to any large extent. The trouble with nature's irrigation system is that she sometimes displays woefully poor judgment in her chronology of distribution. Often at the critical period in the life history of corn, no rain falls and the promise of a full corn crib withers in the drought. If the combination of wind, sun, and clouds would cause it to fall at the proper time, every corn crib would be full and the cotton gins would be busy all winter.

The farm missionaries in their first commandment begin to teach the plan of conserving the natural resources of winter rainfall for the summer development of growing crops. In this simple system the farmer begins working on his spring planting in the fall, plowing his land then and plowing it deeper than he ever plowed it before. This broken ground catches all the winter snows and rain, which would otherwise run off the ground after dampening the soil for a few inches. In the spring the land will be moist with December snows and ready for planting. After that the cotton or corn field is cultivated to keep down the weeds and retain the moisture. This process involves keeping what is called a "dust mulch" on top of the land. This unattractive blanket of dust keeps the soil protected from the rays of the sun and makes capillary attraction impossible. Underneath the surface the only moisture which escapes does so through the roots of the plants. After a period of prolonged drought which killed the natural grasses, the soil a few inches beneath this dust layer has been found to be damp enough to form mud balls. Corn planted and cultivated in this way has often produced sixty bushels to the acre when a field alongside it cultivated in the old haphazard way showed only twenty bushels.

Cotton and Corn Growing Side by Side in Same Field with Melons and Cow Peas, in Lower Panhandle, Texas

Last season Dan B. Ross, of Carthage, Texas, one of the reform farmers, made 916 bushels of corn on fifteen acres of land and seventeen bales of cotton on

the same area, his year's work giving him a profit of $4,000. Yet he did not have any rain from May 12 to August 15—a drought period supposed to make a successful crop impossible. His neighbors crops were so small that one hundred of them had to secure their seed from him.

In the South, the tradition of cheap human labor has long survived the abolition of slavery and the use of the hoe is common. One of the early lessons is to teach the value of additional horse-power. In the Southern states the average farmer works with one mule, and to show him the advantage of more power the government agent often drives a strong team of mules to his demonstration wagon. He will plow a few furrows in competition with the farmer's one mule and then point out the difference in the cost of cultivation.

Splendid Forage Crop—A Fine Crop to Alternate with Cotton. An Oklahoma field.

Dr. S. A. Knapp, who is in charge of the farmers' co-operative and demonstration work, tells in an interesting way of the psychological effect of this work on the farmer: "These field schools are bringing about a revolution," he says. "A meeting of the farmers of a township called at a home to discuss a field crop and to inspect and compare home conditions cannot fail to place local public opinion upon a higher level, and that is the principal opinion to be considered in influencing the farmer. Every step is a revelation and a surprise to him. He sees his name in the county paper as one of the farmers selected by the United States Department of Agriculture to conduct demonstration work; he receives instruction from Washington; he begins to be noticed by his fellow farmers; his better preparation of the soil pleases him; he is proud of planting the best seed and having the best cultivation. As the crop begins to show vigor and excellence his neighbors call attention to it, and finally when the demonstration agent calls a field meeting at his farm the farmer begins to be impressed not only with the fact that he has a good crop but that he is a man of more consequence than he thought. This man that was never noticed before has had a meeting called at his farm; he concludes that he is a leader in reforms.

"Immediately the brush begins to disappear from the fence corners and the weeds from the fields; the yard fence is straightened; whitewash or paint goes on the buildings; the team looks a little better and the dilapidated harness is renovated. Finally the crop is made and a report about it appears in the county papers. It produces a sensation. A meeting is called at the neighbor's and the farmer is made chairman; he receives numerous inquiries about his crop and is invited to attend a meeting at the county seat to tell how he did it. He made a great crop but the man grew faster than the crop."

"The early aviators like Lillienthal used to do this by shifting their bodies. The Wrights and Curtiss and all others today tilt the planes as the wind changes. It calls for *instantaneous* action and the keenest kind of attention.

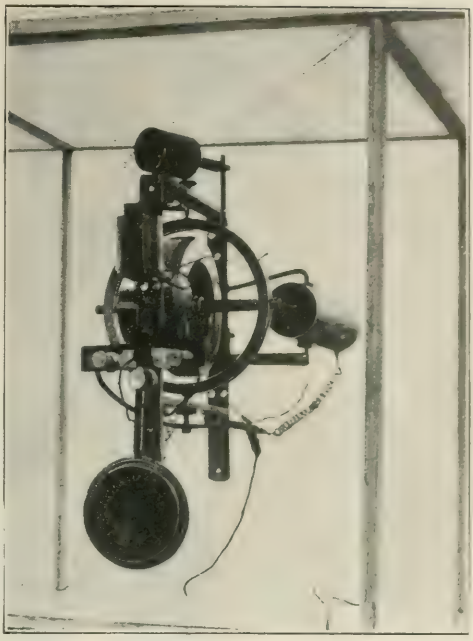
"The aviator must be constantly changing the tilt of his planes to get the varying correct angle to the air currents.

"Now, the idea of this little gyroscope, which, by the way, is designed for a monoplane, is to overcome these sudden little and even big pulls and so to keep the wings rigidly where they ought to be. It is to do what Lillienthal did by twisting and squirming with his body and what other aviators do by the lightning-like rapidity with which they shift the center of air pressure by slight changes of the tilt of the wings. You know once Lillienthal wasn't quite quick enough in his contortions—and, well, he lost his life. There have been others, too, of the new style aviators who haven't been alert enough and have lost their lives. Of course, you know that the main property of a gyroscope is to maintain itself in the same place in which it is originally set revolving, no matter what the pressure is to change it. So when an aviator gets his flying machine started he just starts the gyroscope to keep the wings tilted the way he wants them—this little thing will be a sort of mechanical brain, like the reflex nerve centers of a bird gliding in the air, overcoming the twists of those little cross currents of air."

"Won't it interfere when the aviator wants to change the tilt of the planes voluntarily?"

"No, indeed. You can always stop the gyroscope in a few seconds by a simple braking device—and start it instantly. Try to tip it."

I tried. Then I bore down harder. Then I leaned over and I lifted myself up off the floor on my two hands on one side of it. It might have been one of the Brooklyn Bridge towers for all it yielded. Mechanically I kept on pressing, loath to give up. Then that rapidly flying little wheel inside the case actually rose up on the side I was pressing down. It was uncanny. It was almost human. It seemed to resent—yes, that's the word, resent my interference. The engineer laughed at my surprise.



GYROSCOPE INSTALLED IN AN AEROPLANE.

I took my hands off and the gyroscope leisurely and nonchalantly went back to its first position.

"There is another proposed way of using the gyroscope in connection with a dirigible airship as well as the aeroplane," he continued. "A man in Philadelphia has shown successful models of it. In it the dirigible is propelled after the manner of a ship at sea, somewhat, using the force of the wind and the resistance of the gyroscope. He calls it 'using a lever in space without a fulcrum on the earth.' He has shown that you can 'tack' in the air just as you can at sea."

To most people the main use, as they know it, of the gyroscope is in the monorail car. There are any number of other applications, but before we get to them let us see how the gyroscope will enable a car to run on one track, perhaps even on one wheel.

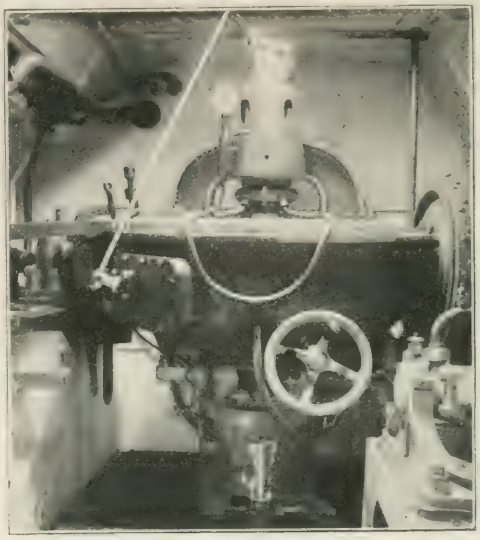
The first practical application of it to cars was made by the English inventor, Louis Brennan, as every one knows, the inventor of the Brennan torpedo, which also applies the gyroscope in a way we shall take up presently.

Brennan began his experiments years ago. The idea of balancing a car on one row of wheels appealed to him. Of course he had a measure of success from the very start. One day he bought a couple of toy gyroscopes. They were nothing like the expensive ones he had at home. But the true solution then flashed over him. He hurried home to try it. Brennan exhibited his model in 1907. It ran over rails straight or crooked. It took curves, it ran over a cable and if you swung the cable it did not fall off but neatly balanced itself. It ran over a gaspipe, anything that its double flanged wheels could grip.

Last year he exhibited a big model. It weighed twenty-two tons, was fourteen feet long, thirteen high, and ten wide but its gyroscopes weighed only three-fourths of a ton. It had a twenty horse-power gasoline engine driving a dynamo and above the dynamo were placed the two gyroscopes, revolving three thousand times a minute. Above the gyroscopes are the glass engine cups. Lubrication is a vital part. The instant these little cups are out of order a danger signal is flashed to the motorman, or engineer, or gyro-chauffeur, or whatever he will be called. For if the oil fails the friction will burn out the axle in an incredibly short time.

Suppose one gyroscope broke down. The other would keep the car upright for hours till it could be run on a siding or supported by struts. The same is true if the power suddenly fails. Running as they do in a vacuum these wheels would actually keep on spinning for a couple of days and would have force enough to hold the car upright for two or three hours.

It runs over the same sort of seventy pound rail that a railroad train runs over, only one, however. It is such a road that it could easily be laid down as fast as an army could move. Temporary bridges would be simple—a hawser or a rail on a single row of piles. War would be revolutionized by a railroad that could advance as fast as the troops. That's why the conservative English have given Brennan a subsidy — an unusual thing for them.



The Gyroscope in Steamer *Seebaer*. It Keeps the Boat from Rolling.

He has patented the application of running a car on one wheel alone—one huge wheel with a car balanced by one pair of gyroscopes as in the ordinary monorail, and another pair to overcome the backward and forward, just as the side to side, tipping. You can swivel the gyroscope and tilt the car. Thus it makes loading and unloading a quick and easy process. In fact in an unevenly loaded car the heavy side tilts *up*. If all the passengers get on one side that side rises.

That same day when the Brennan car was first exhibited, in Berlin a German capitalist named Scherl exhibited a slightly different kind of monorail. Here two gyroscopes are used, also, only they are placed so as to revolve normally in a horizontal plane.

The sensation of riding in a gyroscope car is decidedly exhilarating. The ordinary jolts of a two-railed train are never felt even at a sharp curve, at high speed, in an open car with no springs. Passengers can stand with no supports, in perfect ease—New York will be interested in this: It means that there is an end to strap hanging, even if a seat does not go with every fare.

In 1904 a scholarly German professor, Dr. Otto Schlick, showed pretty convincingly that a gyroscope free to

POLICING THE NATIONAL FORESTS

By HENRY M. HYDE

A GREAT deal has been printed about the "new profession of forestry." To the casual reader it has come to mean a sort of cross between a botanical excursion and a Sunday school picnic in the woods. The chief duty of a forest ranger is conceived to be to act as wet nurse to a lot of pine saplings. And because it is so contrary to American traditions to make a business of saving—rather than making and spending—the man in the street has come to regard Forestry as something amateurish and foreign—a newly imported fad, ranking with polo and the raising of ring-tailed pheasants as an amusement for the idle rich.

Consequently when the average layman comes in actual, first hand contact with a real forest ranger, when he learns something of the life and the work of the tall young fellow on the pinto pony, he gets a brand new thrill. For here is a man who is big-game hunter, frontier sheriff, fire fighter, Texas ranger, and Northwest Mounted Policeman, all in one. Any adventure you please he can duplicate from his daily reports, set down with a stubby lead pencil at his remote shack in the mountains in about twenty awkward words. And he is working for Us. He takes a serious and reticent pride in the fact that whatever may have been charged against other departments of the government, the sincerity and the honesty of the Forest Service has never been questioned. About himself he is not talkative. Familiar association with a range of snow-capped mountains does not promote personal garrulity. But he is always ready to express his pride and belief in the Service. Nowhere, outside of the army, may such fine loyalty—such an *esprit de corps*—be found. And he speaks the name of Gifford Pinchot as a veteran of the Old Guard whispered that of the Little Corporal.

Naturally enough the forest ranger is not likely to be over-popular in the vicinity of the hundred square miles of wilderness which he is set to guard. The stockmen whose cattle and sheep and goats have hitherto freely ravaged the range do not love him. Often enough he is called on to take chances with the hired desperadoes of the cattle-barons, sent out by their employers with instructions to "get" the ranger at any cost. Men who are caught stealing railroad ties and telephone poles from the national forest do not speak of him with enthusiastic affection. Water-power site grabbers and mineral claim thieves, when they find his reports against them and also—greatly to their astonishment—that he cannot be "reached," fill the papers with attacks charging that he is "blocking the development of our imperial commonwealth." In a very real sense the forest ranger is "the law west of the Pecos," and

No wretch e'er felt the halter draw
With good opinion of the law!

But with the real people, the ranchmen and settlers who have a permanent stake in the country, it is a different

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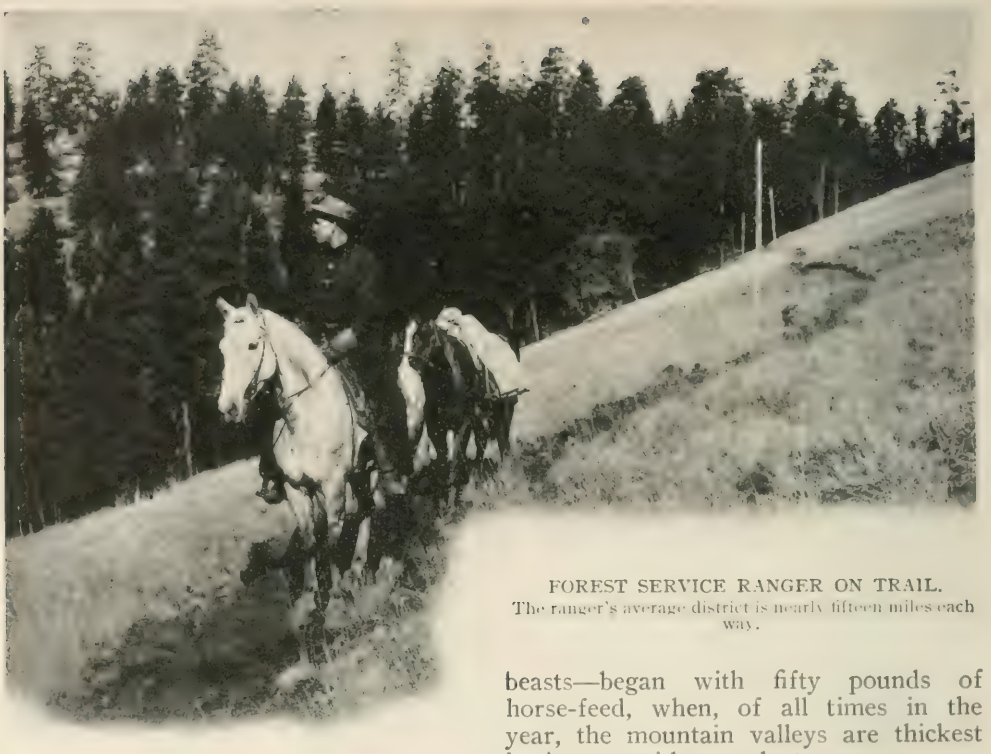


FOREST SERVICE RANGER ON TRAIL.
The ranger's average district is nearly fifteen miles each way.

story. Almost always he has their confidence and respect.

There are a lot of nice boys who are planning to make forestry their life work. Presumably they already know something about the game. Certainly if they come fresh from college to take the examination for appointment as forest rangers they will learn a good many things which are not taught in most institutions of higher education. There is one question, which in some form is asked every candidate, and some of the answers to which are historic in the service.

"If you were ordered, alone, into the mountains for three weeks in mid-August and were allowed only one pack-horse, what provisions—and in what amounts—would you take?"

One immortal youth started his list with twenty pounds of beef-steak, all of which, not already consumed, would spoil on the second or third day; a second thought he should need a two-pound can of baking powder to raise his flour—quite enough to last six or eight months; and a third—ever thoughtful of his beasts—began with fifty pounds of horse-feed, when, of all times in the year, the mountain valleys are thickest in August with succulent grasses.

Being, before all else, a practical service, the written examination is presently over and the candidate is taken out into the open to do things with his hands. Here is a complete outfit for the three weeks' trip, a pack horse and ropes. "Make the pack and throw the diamond hitch, so that frying pans and bacon will not be distributed over the scenery." Here is a bunch of range cattle and horses. "Read the brand on each and identify the owner." Here are branches from a dozen different trees. "Identify each variety and name the high and low limits of its growth on the mountains."

If Clarence can answer these and a few dozen other questions; if he is in perfect physical condition, is a good horseman, has plenty of both physical and moral courage, is both daring and a diplomat, possesses enough endurance to work for thirty-six hours at a stretch without stopping for food or sleep, is fond of his own society and does not object to doing the cooking and washing for himself—then he may be qualified to earn twelve hundred dollars a year as a ranger in the National Forests.

If, wandering among the scattered ranches of the great southwest, you ever happen to come up with three or four of the rangers, off duty and talking shop among themselves, be very sure that you sit tight and listen with both ears. It shall be strange if you do not hear casual relations which make your blood run quicker and start little chills chasing themselves up your backbone. And if, by great good luck, you make a friend in the service, try and persuade him to let you thumb over the diary in which he keeps a record of his daily work. In the first ten pages you will find, hidden in four lines of formal routine, the suggestion of a story which makes the inventions of the dime novel writer seem tame. Here, for instance, is a fragmentary account of a single incident, the facts about which were painfully extracted from a polite, gray-eyed young fellow, in chaps and a brown flannel shirt, who blushed as he yielded to the journalistic cork-screw.

It happened when the National Forests were newer. Cartwright, the ranger, was on one of his first trips over the district. Ten miles out across the high and half-sterile mezas he came to a deep arroyo, in the bottom of which there was still a thin trickle of water. Now in that country water is scarce and precious and it is of first importance that the few lakes and running streams be kept pure and uncontaminated. For fifty feet on either side of the water, Cartwright saw that the ground was miry, half quick-sand. It was deeply cut up by the feet of a big band of cattle which had fought and struggled to get a drink. In the melée about twenty of the half-starved animals had gone down. Their carcasses lay swollen and bloated by the hot sun. It took Cartwright only a moment to read the brand and determine that the derelicts belonged to a rich, half-breed Mexican, one of the political bosses of the territory, a man very much accustomed to do quite as he pleased. He had bitterly

A FOREST FIRE IN THE ROCKIES.

BRUSH PILED AFTER TIMBER SALE REDUCING RISK OF FIRE.

opposed the establishment of the National Forest and had declared that he did not intend to let the fad of these eastern dudes interfere with his business. His ranch house was about fifteen miles to the north. Cartwright turned his pony and galloped up along the edge of the arroyo. The cattle baron was at home.

"Senor," said Cartwright, politely, "twenty of your cattle are dead in the Arroyo Grande at the crossing of the Holy Angels trail. They are already a nuisance. I am Ranger Cartwright of the Forest Service and I have come to say that the bodies must be buried within twenty-four hours. Otherwise the Service will have it done and collect the money from you. And before you turn another bunch of cattle on the National Forest range you must make a contract with us."

The Mexican was very complaisant. He would have the dead cattle attended to at once. And he would not trespass again on the forest range. With Spanish grandiloquence he expressed his undying sorrow at having put Cartwright to so much trouble. It was not at all what the ranger had expected. "Thank you," he said and rode away. Fifteen minutes later two negroes rode out of the corral, turned their ponies across the arroyo and followed Cartwright to the south, taking a trail which kept them out of his sight.

The Ranger was bound for the 'dobe house of a Mexican, near where he had found the cattle. There he would spend the night. As it grew dusk he turned his pony and started to climb down the steep side of the arroyo. Near the bottom something struck him in the chest and he toppled sideways out of the saddle. Falling he heard, faintly, the bark of a revolver.

Presently he recovered consciousness and put his hand up to his heart. There was a hole in his flannel shirt. Directly beneath it, in the pocket, was the thick diary in which he wrote his daily reports. He pulled the book out and found, half way through it, a thirty-two caliber bullet. The fallen bridle reins had stopped his pony a few rods off. He mounted, rode to the house of the Mexican and slept soundly until morning. Then he shot across country to head-

quarters, told his tale, and came back twenty-four hours later with the forest supervisor and three other rangers. They found the cattle still unburied in the arroyo. A dozen Mexicans, with horses and ropes, were put to work, pulling out the bodies and digging pits for their interment. They were paid a dollar each for the twenty carcasses taken care of. Then, with the supervisor at their head, the five men loped off up the meza to the ranch of the offending cattle baron, who turned gray under his swarthiness as he saw Cartwright with the rest, loking very much alive.

"Senor," said the supervisor, sternly, "we have come to collect twenty dollars for burying your dead cattle in the Arroyo Grande. Here is a receipt for the money." For an instant the cattle man looked into the icy gray eyes of the supervisor, then turned into the house and came back, instantly, with the money. "I want to say," the supervisor went on, "that if any more careless shooting is done around here I'm afraid it will be impossible for us to keep the boys from hanging somebody."

Over in the archives of the Forest Service at headquarters one may still see Cartwright's diary, with the bullet hole half way through its pages.

Cartwright spent last winter in the wildest part of his district on an assignment from the supervisor to "clean out the mountain lions." His diary for those months would furnish a literary big-game hunter with material for a dozen volumes. In the spring he moved into a shack at the bottom of a remote valley. The valley is so narrow and the peaks which hem it in are so tall that the sun sinks out of sight by five o'clock. Then, almost instantly, the evening air comes down, cold and bracing, from the high snow-fields. Looking up one sees the white heads of Pecos Baldy and his company of venerable brothers bathed in vivid crimson and it is easy to understand why the old Spaniards called the range the *Sangre de Cristo*—the Blood of Christ. On the bare summit of the

RANGER FIGHTING A BRUSH FIRE.
The fire cannot be left until entirely extinguished.

A Forest Ranger's Work in Winter is No Play.

tallest mountain of them all a great wooden cross looms black against the sunset. It is the sign of the Penitentes—that secret and proscribed order of Mexican fanatics who, on good Friday, lash their leader to such a cross and carry him, head downward, up the mountains on their backs. Cartwright, himself, had heard their wails and watched their weird procession as they crept painfully upward, lashing themselves, meanwhile, until the blood dripped down into the snow.

On one such evening Cartwright had an invitation to attend a dance at the Lazy H ranch, twenty miles away down the mountains. What follows is a story after hours and never even got a line in the daily report.

It was time to start. Below the shack, where the grass grew tall along the edge of the icy, brawling Pecos, his two hobbled ponies were grazing. He caught the sorrel, cinched on the big cowboy saddle, and left the beast standing before the door of the shack, the bridle reins hanging to the ground. As he buttoned his clean brown shirt and pulled on his chaps, he glanced a second time at the cartridge belt, with the big forty-five in the holster, which hung on the deer's horns against the door. He would hardly need such a weapon at a dance—there was to be a girl from Boston at the party, too. The revolver was left hanging inside, as he locked the door of the shack, threw himself on Pedro's back, and started at a trot across the bottoms to ford the river and climb the trail to the top of the pass.

At the top of the high bank Pedro simply sat down on his tail and slid like an otter to the edge of the water. Then, picking his sure-footed way across the riffles, the pony started, with a free rein, to zigzag up the steep side of the mountain. To an eastern horse and rider it would have been as easy to climb the side of the Flatiron building, but to Cartwright and Pedro it was one of the unnoticed commonplaces of the day's work. Even in the dark Pedro could be trusted to find and keep the trail. Saving four miles by the climb they turned into the wagon road at the summit of the pass and went slipping down the far side of the range at an easy lope. Looking back for a last glimpse of the shack Cartwright saw that a coyote had already come down out of the woods and was snooping about for scraps. As he looked, the gray-yellow beast raised its head and started the echoes with its mournful yelp.

Where the road swung out on the overhanging shoulder of the mountain, Cartwright could look down and see the sun still shining on the yellow 'dobe houses of the Portuondo settlement at the bottom of the next valley. Three men were squatting on their haunches like dogs in the middle of the road and a fourth, glancing upwards, went swaggering into the low door of the nearest hut. All up and down the valley the Portuondos were known as a drunken and worthless crew, quick to use their

knives and fond of doing their fighting like wolves in packs of ten or a dozen to one.

The old man was still alive and lived with his wife and three youngest children in the 'dobe at the center of the row. As each of the six elder boys had married he had built on an extra room and the five married daughters had brought their husbands home to live in similar extensions. Now there were twelve families under the one long, low roof, the buildings stretching for a hundred feet along the road and back as far on each end about the court. Twelve men and as many rowdy, half-grown boys, with twenty big, shaggy, and savage curs, made up the fighting force of the Portuondos. As Cartwright recalled his dispute with the family over their timber claim in the heart of the National Forest he thought for an instant with regret of the revolver he had left behind him.

Dropping down into their valley he pulled Pedro into a walk. It would never do to let the Portuondos get the idea that he was afraid of them.

"Buenos noches, senor!" called one of the men in the road, getting up to his feet. Cartwright bade him good evening in Spanish and stopped his horse. The other two rose. The man who had gone into the house came to stand in the door and sing in broken English "My Old Kentucky Home." Cartwright knew that meant trouble. When Jose Portuondo was feeling particularly bellicose that was always his way of showing that he was just as good and a little better than any gringo.

"So you have reported to the supervisor that our claim covers only forty acres and that we have been cutting ties outside it," sneered the man who had first spoken. "Yes, I have," Cartwright answered. "I think you are very much mistaken, my good senor," the man answered. Cartwright grinned and pressed Pedro with his knees. The pony took two steps forward until his rider was even with the speaker. "I don't make many mistakes in my surveys," the ranger answered.

The Mexican pressed close up to the saddle and made a most elaborate gesture of contempt. "Bah! You are a billy-goat with a long gray beard!" he yelled.

Now it conveyed to John Cartwright, late of Boston, Mass., no overwhelming sense of shame and humiliation to be compared by a drunken and irresponsible Mexican to the head of one of the big herds which pasture on the high ranges of the territory. But Cartwright, the forest ranger, knew very well that to the Mexican mind a man who would stand what he had been called would stand anything. He pressed Pedro again with his knees. As the pony stepped ahead he leaned forward from the saddle and smote the champion of the Portuondos full on the point of the jaw. As the man tumbled backwards, heels over head into the sand he let out a yell of commingled rage and pain. At the instant out of eight doors sprang as many

The Rangers Estimate the Standing Timber in Their Districts.

A FOREST RANGER ON HIS ROUNDS.

men, each yelling for vengeance at the top of his voice. The windows were full of women and children, shrilly crying. And twenty cur dogs, barking in as many keys, lent background to the bedlam. Pedro was trembling with excitement. Cartwright quieted him with pats on the neck.

Jose Portuondo, still humming his broken battle-cry, stepped forward. He was the oldest, the blackest, the biggest of the family. He made a shrill oration, inviting Cartwright to dismount from his caballo and be painfully transformed into food for coyotes. Cartwright smiled.

"I am sorry that I have another engagement for this evening," he told them in Spanish. "Since it is with a lady I cannot, of course, break it. But tomorrow—manana—I will come and spend the day with you."

Fired by the presence and the cries of all his clan Jose leaped forward and grasped Pedro by the bridle reins. At the same instant the pony felt the prick of the spur in his side. As he sprang into the air his rider leaned over and floored Jose with a smashing blow on the nose. The other warriors scuttled out of the way of the pony's heels. And Cartwright, turning back over the saddle to wave his hand in farewell, cried, ominously, "Manana! Manana!"

Pedro took him to the Lazy H ranch in time for the second two step on the program. The festivities lasted until one o'clock in the morning. Cartwright had three divine waltzes with the girl from Boston, and his partner in the Virginia reel was the wife of the second richest cattle man in the territory, who wore a gown which she had just brought back from Paris. One of the bachelors present was Cartwright's superior, the forest supervisor, who had stopped off on a trip of inspection after riding thirty-five miles from Sante Fe since noon. To him, when the dance was over, he told the story of his encounter with the Portuondos.

"In the morning," said the Supervisor, with a twinkle in his eye, "we'll stop off on our way up to the shack, and make that bluff of yours good. If you'll hold

CATTLE GRAZING ON NATIONAL FOREST RESERVE.

half of them off with your gun I think I can lick the rest. And when I get through you can clean up what's left."

It would be incorrect and unfair to give the impression that Cartwright and his fellows are fond of fighting and are accustomed to enforce their authority with fists and more deadly weapons. To the contrary they will go to almost any length to avoid and prevent trouble. They know how to be diplomatic in two or three languages. It is part of their daily work to settle disputes between furious and violent sheep-herders and cattlemen. They take great pains to explain the law to men who violate it ignorantly. They give every offender the benefit of every doubt. They are the apostles of peace and order and respect for the rights of others. BUT—the small word should be printed in large capitals—one has only to look at Cartwright, tall and lean and hard, with his cold gray eye and his quiet voice and manner, to know that in any emergency he may be trusted to look after himself and after the credit and prestige of his beloved service. For John Cartwright is very far from being an amateur or a dilettante. He is a Man who is not afraid, and who knows his job.

THE PASSING OF THE PIGMIES

By

RENÉ BACHE

WITH the last batch of wild animals' skins and other faunal curiosities received by the Smithsonian Institution from Colonel Roosevelt, there was a bunch of Pigmy arrows, to which was attached a paper tag bearing a warning not to handle them carelessly, inasmuch as they were probably poisoned.

The Colonel did not come across any of the Pigmies himself, while in Africa, but received the arrows from a friendly traveler who had passed through the country of the dwarfs, toward the sources of the Nile. It was in that region, in the shadow of the Mountains of the Moon, that they were located by Herodotus, the Greek historian, as early as 500 B. C., and there they were found not many years ago by Schweinfurth, the explorer who preceded Stanley.

For more than one reason these little people are exceedingly interesting. In the first place, they appear to represent the most ancient of all the races of men now dwelling on the earth. They are today, in all likelihood, just what

PIGMY BOY.
The children are not burdened with clothing.

PIGMY GIRL.
The primeval type—more ancient than any other human race on the globe.

they were in ages before the earliest dawn of history. While countless dynasties of Egypt, Assyria, Persia, Greece, and Rome have flourished and expired, they have survived. Civilizations have arisen and perished, but they remain unaltered —save that they have greatly diminished in numbers. As Stanley says, there was doubtless a time when the pigmies "reigned over Darkest Africa, undisputed lords."

Dwarfs have furnished themes for countless romances. They divide with giants the interest of a thousand nursery tales. To no small extent the domain of superstition is invaded by them. All countries, more or less, are infested by gnomes and goblins. They appeal to the imagination, and connected with them there is always at least a suggestion of the supernatural.

Nevertheless, the accounts of the pigmies given by Herodotus and others had long been set down as purely fictional when they were re-discovered by Schweinfurth. He found that the men averaged about four feet, six inches in height, while the women were three or four inches shorter. Their color was like that of "coffee slightly roasted;" their legs were short, their hands very small, and their stomachs huge. They had a habit of leaping about in the high herbage "like grasshoppers," and one of them, purchased by the explorer, was to such an extent subject to this inclination that he could never learn to carry a plate without spilling more or less of the contents.

Another explorer, named Miani, who followed in Schweinfurth's footsteps, bought two young dwarfs for a dog and a calf, and, taking them back to Europe with him, gave them to Count Miniscalchi. By that nobleman they were brought up and educated, proving both intelligent and tractable. They were named Tebo and Chairallah. Chairallah died, but Tebo grew to manhood, and, though it had

COURTESY SMITHSONIAN INSTITUTE, WASHINGTON

HUMERUS. TIBIA.

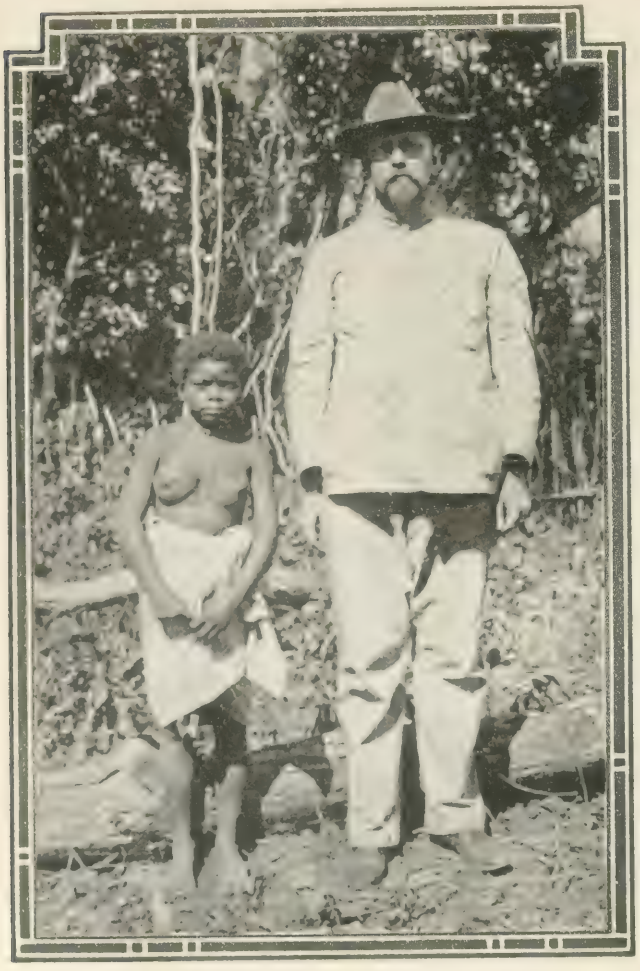
BONES OF PIGMY COMPARED WITH THOSE OF WHITE MAN.

been freely predicted by many skeptical persons that he would turn out to be just an ordinary human being in respect to height, he never did, as a matter of fact, attain more than the ordinary pigmy stature.

The first pigmy seen by Stanley in Africa was a young woman, only thirty-three inches tall, yet "perfectly formed, and of a glistening sleekness of body." She appeared to be about seventeen years old, and her complexion was that of a quadroon, or the color of yellow ivory. Her eyes were magnificent, but "absurdly large for so small a creature—almost as big as those of a gazelle, and extremely lustrous." Though absolutely nude, she was entirely self-possessed and evinced more curiosity than fear.

Measurements made by Stanley showed that four feet, six inches was about the maximum height of the dwarfs, some of whom were not more than three feet in stature. A full-grown man might weigh as much as ninety pounds. Scattered over a region about two-thirds the size of Scotland, they live in the uncleared forest, and maintain themselves by hunting. They are called Akka, or Batwa.

Subsequent observation of these little people led Stanley to describe them as "parasites"—their method of living being to establish their more or less temporary villages around the permanent towns occupied by native agricultural tribes of negroes. To the latter they make themselves useful in various ways, hunting game (which they sell to the big negroes for knives and other supplies), and acting as scouts. Incidentally, by theft and otherwise, they levy a considerable tax upon the host tribe; but the latter cannot well afford to anger them or drive them away, inasmuch as their help is very desirable and even necessary in a region where inter-tribal wars are of frequent occurrence.

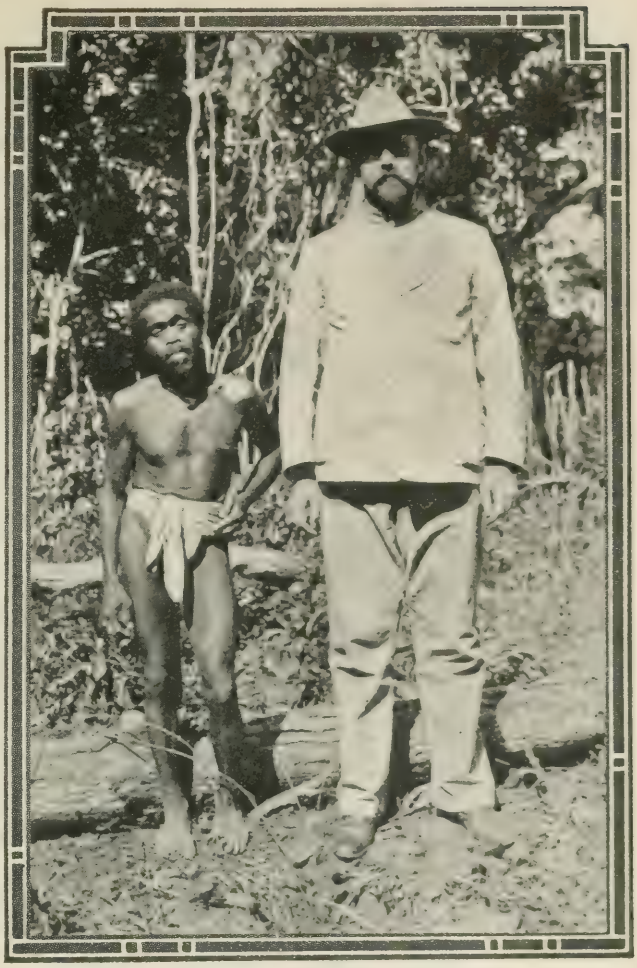


An Average Pigmy Woman Beside Prof. Worcester.

They are fierce little folk, and, though they have no weapons save bows and spears, their warlike disposition and poisoned arrows make them greatly dreaded as enemies. One of these arrows will kill an elephant with as much certainty as a bone smashing rifle bullet, and a mere prick will bring death to a man in a few minutes. The pigmy warrior always carries in a small leather bottle hanging to his belt a supply of the poison, which is said to be obtained by macerating the bodies of

ants of a certain venomous species.

The dwarfs live in dome-shaped huts less than four feet high, built of branches roofed with a thatch of leaves. These little houses are arranged in a circle, with the residence of the chief in the center. At a distance of 100 yards from the village, on every little path leading to it, is placed a sentry house, big enough for two little men, with a doorway looking up the track. With such a miniature town commanding every cross-way on the outskirts of a permanent negro agricultural settlement, the latter is protected against any unexpected attack. In this way, indeed, the dwarfs may be said to act as a sort of frontier guard between negro states.



Prof. Worcester With a Full Grown Pigmy Man.

The Akka are described as having the color of a half-baked brick. Their skin is much wrinkled, especially about the corners of the eyes, which gives them a look of premature old age. Their noses are flat, their lips thick, and their eyes reddish and set close together. The whole body is covered with hair, stiff and so surprisingly thick as to be in some instances like felt. Stanley, however, makes them out to be of two distinct tribes, one of which, occupying the southern half of the district already mentioned, is much more agreeably featured, with large, gazelle-like eyes and a complexion like yellow ivory. To this latter people, which he calls the Wambutti, belonged the pigmy girl whom he found so attractive.

The male dwarfs hunt, fight, and smoke, while the women do the cooking and other work. They are great hunters, and contrive most ingenious traps. For the capture of chimpanzees, they build a shed-like structure, the roof of which is suspended by a vine, while plantains are placed beneath for bait. When the animals venture in, the roof falls upon them. They collect honey and palm wine, and also make poison for sale to the big negroes, receiving payment in tobacco and potatoes.

They go practically naked, wearing nothing more than a string of bast, with a flap of bark cloth. According to their notion the parrot is a man, because he can talk, and the monkey is a man, because he looks and uses his hands like a man. And they add that parrots, monkeys, and men are all good to eat. It is natural that they should be suspected of cannibalism, in a part of the world where the practice of eating human flesh, when opportunity offers, is undeniably com-

mon, but this point has not been established. They are probably the smallest people in the world, and there is good reason for believing that they do actually represent a primeval type of man—more ancient than any other race on the face of the globe.

At the same time, it puzzles anthropologists very much to find the same race of pigmies, or what appears to be such, in parts of the world so distant from Equatorial Africa that transportation from one region to the other would seem to be almost out of the question, whether over land or by water. Viewing the matter merely as a problem of distribution, how does it happen that dwarfs of the same family occur in the Philippine Islands and in a small archipelago of the Bay of Bengal? Concerning these we have reason to entertain a more than ordinary interest, now that the Philippines have become the property of the United States.

PIGMIES OF THE ANDAMAN ISLANDS SPEARING TURTLES IN THE BAY OF BENGAL.

In the Philippines they are known as Aëtas, and there is no question of the fact that they represent the ancient aboriginal population of the islands. Formerly they must have been very numerous, but within recent years, like the pigmies in Africa, they have become greatly reduced in numbers, and today only a few thousands of them are left in Luzon, in the northeastern part of Mindanao, and scattered through other parts of the archipelago. When, some centuries ago, the Malays took possession of the coast regions, the dwarfs retreated to the interior, where, at the present time, they live in the mountains, wandering about in small groups, away from frequented roads and paths. Some of them, however, have been induced through the influence of missionaries, to settle down in more or less permanent villages, where they make a pretense of cultivating the soil. Occasional individuals are even employed as servants by Americans and Spaniards, and are found both intelligent and faithful.

These dwarfs of the Philippines are very dark in color, and the men average about four feet, seven inches in height. The women, of course, are smaller. Though so tiny, they are very muscular, using with ease bows which the strongest white man is unable to string. They are wonderful runners, and their senses are astonishingly acute. It is said that they are able to recognize by smell alone

from what flowers the bees have gathered honey.

Save for the few who have come within civilized influence, these pigmies have neither houses nor fixed settlements. They neither sow nor reap. They hunt monkeys and wild hogs, and, when they have killed an animal for food, they remain on the spot as long as anything is left to consume. Arrows are their only weapons, but these are sometimes poisoned. It is difficult to meet them, for they shun contact; yet, as a rule, they are inoffensive if let alone. Their huts, when they take the trouble to build any, are of slender poles, fastened together at the four angles, and walled and roofed with palm leaves. A floor of poles is placed at a height of two feet above the ground.

PIGMY DECORATIONS.
Woman scarring man's chest with bamboo splint.

They go pretty nearly naked, the women wearing a small circular apron, while the men are content with a string around the waist, from which rags hang before and behind. Their hair is very fine, crisp, and closely curled, but not even the women ever take the trouble to arrange it in any way. A curious mode of ornamenting the body which they practice consists in making rows of deep incisions in the skin of chest and stomach with a splinter of bamboo, a bright blue earth-pigment being afterwards rubbed in. The process must be extremely painful.

Under ordinary circumstances they do not inhabit dwellings of any kind, but sleep wherever night overtakes them. Their domestic utensils are cocoanut shells, large sea shells, and rude boxes of wood. When one of them dies, the body is wrapped in the bark of a tree, taken off entire, the ends being closed with resinous gum. Then, after feasting and getting drunk on palm-wine, they inter the departed in a hole in the ground, standing upright. If there is a hut convenient, they bury him under it, and burn the house over him.

They name their children after plants and animals, and they file their upper front teeth to points. Their epistolary correspondence is accomplished by the sending of knotted grass stalks. As for

Photo, Patrick Lyon.

their religion, it appears to consist in a belief in ghosts. When they are persuaded to sow corn and sweet potatoes, their planting is done on so small a scale, in tiny fields near streams, that it seems as if merely for play. But the fields are soon abandoned, and they move off to another place. Some wax, honey, and other forest products, they gather and sell to civilized folks for tobacco, rice, knives, and trinkets.

Pigmy Substitute for Clothes.
The scars on this woman are for decorative purposes.

These dwarfs of the Philippines are evidently the little-modified descendants of an extremely ancient race. The celebrated and original Wild Man of Borneo, exhibited by P. T. Barnum a generation ago, was in reality, by the way, an Aëta from Luzon. Not so very long ago pigmies of the same race were numerous on the Island of Formosa, where their bones are found to this day in the mountains of the interior. This is as might be expected, inasmuch as Formosa, geographically speaking, belongs to the Philippine Archipelago, being the northernmost member of that group. Doubtless the little people were killed off by the warlike Malays.

A nearly-related tribe of "Little Niggers," as sailors call them, is found in the Andaman Islands, in the Bay of Bengal, where they represent the aboriginal population. They are about the most primitive people in the world, having had no knowledge until recently of any means for making fire. It is true that they had and used fire, but they obtained it from a natural volcano on one of the islands, and kept it alive in logs of decayed wood. It is said of them that they look like babies all their lives. They have very frizzly hair, growing in spiral tufts, and tattooing serves them as a substitute for raiment, though the women wear small aprons of leaves.

These pigmies of the Andamans had formerly the habit of murdering any strangers who were luckless enough to be shipwrecked on their inhospitable shores. For this, however, they were not perhaps to blame, inasmuch as Chinese and Malay traders had long made a practice of capturing them when occasion served, and carrying them off as slaves. They know nothing of agriculture, and their dwellings are fragile huts of poles, roofed with palm leaves. For ornaments, they wear necklaces of the bones and teeth of their relatives. Unfortunately, they are now fast disappearing, due to the introduction of alcohol and diseases, particularly measles, by white people who have established themselves in the little archipelago, as the Andamans are now utilized as a penal colony.

In Madagascar are two distinct tribes of dwarfs, not very well known, but declared by some authorities to be even smaller than the pigmies of equatorial Africa. They are called, respectively, the Kinos and the Behosy—the former being rather light in color, with remarkably long arms, and pursuing a pastoral life in the south-central part of the

great island, at a high elevation above the sea. The Behosy, on the other hand, are wholly savage, occupying a densely-wooded region, and jumping from tree to tree like monkeys, so as to be not easily pursued. They are very timid, and it is said that they sometimes die of fright when captured.

Musical Instruments of the Pigmies.

The little people, wherever they now exist in the world, are passing away, and before very long the last of them will have disappeared. There are only a few thousands of them left in Africa. A few thousands more are still to be found in the Philippines and elsewhere. In the forests of the mountainous interior of India some tribes of them are said to linger, their small size and primitive mode of life obtaining for them the name of "monkey men." Their final departure is inevitable. A pity, too, it seems; for, although the pigmies cannot be regarded as important contributors to the welfare and progress of mankind, they furnish a most interesting memorial of the ancient past of the human race.

SAVING THE WOOD WASTE

By

WILLIAM L. NINABUCK

WITH two-thirds of every tree cut down, wasted; with large stumps, branches, slabs, sawdust, and shavings burned because the country does not know how to use them; and with statistics showing that in twenty-five years at the present rate of destruction, wood will be a luxury and a forest a curiosity; it is no less than a stern duty for Uncle Sam to take measures staving off the imminent wood-famine.

The dedication of the new United States government forest products laboratory at Madison, Wisconsin, this spring, marked the beginning of such measures. This national laboratory, the first of its kind to be established in the United States, will face the problem of teaching the country how to utilize these neglected by-products of lumbering. The building, a handsome, three-story, fireproof structure, was built by the University of Wisconsin at a cost of $75,000, and the national government has expended a like amount in the equipment of experimental wood-testing and preserving machinery. A staff of some twenty experts and investigators, also furnished by the government, is in charge of the work. At its head is McGarvey Cline, a graduate of Purdue University in 1904, one of the best informed men on forestry problems in the United States Forest Service.

One of the biggest problems the experts will have to deal with is that of making good print paper from materials other than spruce and hemlock. These two woods have been used almost exclusively in the manufacture of print paper and up to the present time no satisfactory substitute has been found.

So scarce are they becoming that newspaper men, anticipating the coming necessity, are experimenting with white ink on black paper to get rid of the difficulty. To keep so peculiar a state of journalism in the future, much of the work of the laboratory for a time will be put on this phase of the experiments. To this end a complete paper-making plant has been installed in the building to facilitate the study of making paper from various woods.

Another problem is that of preserving wood from the destructive work of insects, fungoid growths, and fires. It is a conservative estimate that 740,000,000 cubic feet of lumber are destroyed every year by premature decay and by marine insects. The discovery of a method of preserving that lumber will result in an enormous saving and be a great aid to the cause of forest conservation. Railroad ties and water-front piers, as well as timbering in the mines, are the greatest prey of the insects. Without preservation the average tie lasts about six or seven years, and must then be replaced. As a result the railroads of the United States demand 100,000,000 ties annually. The laboratory will seek to find a preservative that will double or treble the life of these ties. Water-front piers and mine timbers are subject to insect destruction in a still greater degree because of the moist atmosphere about them. Besides loss in the wood itself, the decayed timber is the cause of numberless mine cave-ins with their resultant loss of life and property.

A deep rotting-pit at the right degree of temperature and humidity to best suit the various conditions under which these timbers are used is in the basement of the laboratory. Into this have been introduced different woods, both preserved and unpreserved, with the borers attached, so that a comparison of the resulting decay may be made. The preservative department contains two great treatment cylinders in which oil at different pressures up to six hundred pounds per square inch can be forced into the wood to prevent decay and insect ravages. For experimental purposes, cultures of every sort of vegetable growth which feed on wood fibres, and samples of minute timber-destroying animalculæ have been accumulated from all parts of the country. One of the objects of the laboratory is also to experiment with substitutes for railroad ties and mine timbers, such as concrete and steel.

UNITED STATES FOREST PRODUCTS LABORATORY AT MADISON, WIS.

The disposition of pine stumps has always been a great problem with American lumbermen. They are usually burned, for, although they may be distilled for turpentine and wood alcohol,

the labored processes necessary have proved such a use uneconomical. However, if a simpler process of extracting those products could be devised, a great saving would result as well as a reduction in the price. The chemical department of the laboratory is particularly well fitted with stills and retorts for experimentation along this line.

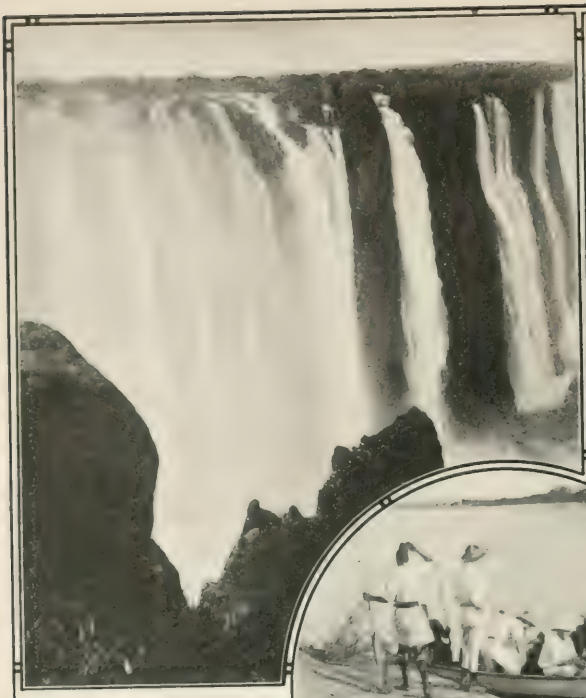
Then there are various torsion and weight machines which are to be used to test the relative strengths of different kinds of woods, to demonstrate which are best suited to stand the strain and wear of bridge and building construction. Special kilns and ovens will show the shrinking and warping tendencies of different woods. Carloads of huge spruce, pine, and hemlock logs have been accumulated from various parts of the country, and old stumps and railroad ties half destroyed by borers, contributed by publishers and lumbermen, are under cover awaiting experiment.

While the results of experiments will be equally looked for by lumbermen and kindred interests, representing a present investment of $2,500,000,000 over the entire United States, the University of Wisconsin will receive direct benefit, the college of engineering having co-operated with the laboratory. Several courses will be given, for the benefit of the students, in wood technology and in mechanical engineering of woodworking plants. Members of the staff will also lecture for the university forestry courses, and instructors and students will have constant access to the laboratory for original research work, on the preservation of timber.

McGarvey Cline.
Director of United States Forest Products Laboratory at Madison, Wis.

Those green-robed senators of the mighty woods,
Tall oaks, branch-charmed by the earnest stars,
Dream, and so dream all night without a stir.

—Keats.



The Vast Volume of Water Descending in Wreaths of Wonderful Charm.

The Cataract and Gorge from the Railroad Bridge.

The Regatta Course above the Falls.

THE VICTORIA FALLS BRIDGE.

THE VICTORIA FALLS ON THE ZAMBESI RIVER, AFRICA.

THE NIAGARA OF AFRICA

By

DARWIN S. HATCH

AMERICANS are accustomed to look upon Niagara Falls as the very finest example of Nature's handiwork, but South Africa can boast of a cataract that for grandeur and impressiveness rivals our Niagara. At the Victoria Falls, in Rhodesia, the Zambesi River plunges over a precipice more than twice the height of Niagara, sending into the skies a rainbow wreath of mist two thousand feet high. The natives call the wreath the "Pillar of Light," and the falls, the sound of whose plunging waters can be heard twenty miles away, are aptly named "Thundering Smoke."

Just above the falls the Zambesi is a placid stream over a mile wide, but eons ago some volcanic tremor of the earth tore open the black basalt, leaving an abyss four hundred feet sheer, and only six hundred feet wide. Here the mile-wide river is suddenly constricted and plunges into the gorge which immediately turns at right angles. There the river, fresh from its leap, forms the "Boiling Pot," a monster whirlpool where the tortured water is driven back on itself, shaking the cliffs' foundations, heaving, whirling, leaping in pyramids, sinking into gulfs, and roaring with thunder multiplied a hundred times by the echoing cliffs. Thence the river turns and twists through a black-walled cleft which zigzags for fifty miles as though it were cut by some Titan's chisel in the living rock.

In the four-hundred-foot plunge of the mighty Zambesi lies latent energy which would dwarf the boasted power of Niagara. There the energy of thirty-five million horses is going to waste—enough if converted into electricity, to make "Darkest Africa" light as day.

Plans are now on foot to turn a part of the vast energy of the falls to the uses of man. The initial installation will, it is planned, be 20,000 horse-power turbines, which will turn massive dynamos, the electric power thus generated to be transmitted to the mines of Rhodesia. Far-sighted engineers believe that the present generation will see a mighty city—Victoria City, perhaps—established at the falls and monster industries, attracted by the limitless power, sending their products to all parts of the world.

The daring cantilever bridge on which the "Cape-to-Cairo" trains crawl across the whirlpool, four hundred feet below, presented many problems that could only be solved by the ingenuity of the engineers. For instance, when the work was first begun, Wilson Fox, an engineer, had to cross the gorge. He shot across a rocket to which a cord was tied, and a wire rope was then pulled over and made fast. Fox rode across the whirlpool in a sling, the first man to cross the "Boiling Pot" alive.

Livingston, the explorer, is the discoverer of the cataract, and in the bark of a tree on Livingston Island, at the very brink of the falls, the initials D. L. bear him witness.

THE SANTA FE PRE-COOLING PLANT NEARLY COMPLETED.
It cost nearly a million dollars; is a quarter of a mile long; and handles thirty-two cars every five hours.

ARTIFICIAL BLIZZARD TO SAVE FRUIT

By

WALTER V. WOEHLKE

DURING the last thirty years, ever since the advent of that ice-box on wheels, the refrigerator car, the business of making, storing, and selling frozen water has grown, until today it has assumed enormous proportions and has become an important factor in the economic life of the nation. Should a sudden ice famine descend upon the country in midsummer, it would be followed almost immediately by a famine of fresh food in the big cities, all of which depend upon the refrigerator car and the cold-storage warehouse for a large portion of the stuff that goes into their insatiable stomachs. And yet, despite this development of the ice industry, until recently little progress was made in the methods of handling the immense amount of freight shipped in refrigerator cars. For thirty years no fundamental changes were made in these methods. For thirty years these cars were filled with perishable freight and ice in the same manner as the refrigerator on the back porch is filled and with results even smaller, until the pre-cooling method of shipping perishable freight was evolved and put into practical operation during the last year.

All refrigeration has for its object the chilling and numbing of the multitudes of bacteria and fungi present in organic matter so that they cannot multiply and cause decay by their activities, and the retardation of the zymotic processes of ripening, whether the refrigerated stuff be fruits, vegetables, fresh meat, eggs, butter, or beer. To retard these processes in transit the foodstuff is placed in the car at the point of origin, the loaded car is switched to the icing platform, the bunkers at either end are filled with ice, every opening is hermetically sealed, and the car is sent off. The cold air in the ice-packed bunkers, obeying the law of gravitation, sinks to the bottom of the car, absorbs some of the heat of the lowest portion of the warm freight, rises to the top as its temperature increases until it re-enters the bunkers for another circuit. Of course, air spaces have to be left in the load of freight to allow the cold air access to all parts. By this slow process of gravity circulation the perishable freight in the car is not cooled off sufficiently to prevent decay or ripening until two, three, and sometimes four days after the start, according to the temperature of the freight at the time of lading. Even when the lower two-thirds of the carload have attained the required minimum, the upper third, especially in the center of the car farthest from the bunkers, is sev-

eral degrees warmer than the minimum. Because the ice in the bunkers cannot conquer this relatively high temperature in the upper part of the car, the shipment of fresh deciduous fruits, of peaches, plums, apricots, and cherries, of melons, grapes, berries, and sensitive vegetables, is restricted by the distance over which the upper portion of the freight can be carried with safety, thus preventing the development of the markets farthest distant from the producer.

As the processes of ripening and decay proceed rapidly immediately after fruits or vegetables are picked, during the first two or three days in the perambulating ice-box while the temperature is falling very slowly, the growers could not, under the old method of icing, ship fully matured stuff over long distances. They had to pick their fruits and vegetables green and hard to prevent them from becoming overripe on the journey. As a result the buyer received tasteless, flavorless produce which hurt the reputation of the producing districts and the feelings of the consumer.

Take a peek into the refrigerator on Mrs. Jones' back porch any Sunday morning in summer when it is doing its biggest business. You will probably find a quart or two of milk, a pint of cream, four or five boxes of berries and fruits, two pounds of butter, a five-pound roast, some chops for breakfast, a little cheese, tomatoes, and other ingredients of the Sunday meals. Altogether the weight of the food to be kept cool, including the weight of the dishes and wrappings, will be barely thirty pounds and usually much less. A fifty-pound cake of ice, almost two pounds of ice for every pound of food, reposes tearfully in the ice compartment. With those odds of two to one in favor of the ice in your mind, look into a refrigerator car carrying 28,000 pounds of fruit. If this car were to be cooled as effectively as Mrs. Jones' ice-box, it should carry 50,000 pounds of ice. Instead of that, it carries but 9,000 pounds, or but one-third of a pound of ice for every pound of freight. Precooling aims to equalize the odds in the refrigerator car, to do the work that cannot be performed effectively by the 9,000 pounds of ice, to reduce the temperature of the freight to the minimum *before* the car starts out, leaving to the ice in the bunkers only the comparatively light task of keeping the temperature down.

It stands to reason that a specially equipped stationary plant of large size can remove a certain number of heat units out of fourteen tons of freight better, faster, and cheaper than a small plant on wheels depending for its refrigeration solely upon an insufficient quantity of ice. The ice in the car cannot reduce the temperature of the cooling me-

MIXING THE BRINE WHICH CIRCULATES THROUGH THIRTY-FIVE MILES OF COILED PIPE TO REDUCE THE TEMPERATURE OF THE PRE-COOLING AIR BELOW ZERO.
The salt may be seen overflowing the chute which conveys the water.

Ice and Cold Air Enter Car at Same Time.
The flexible coupling conveying the cold blast is seen on the right, while immediately in front of it the cakes of ice are entering the car.

nardino plant in the spring of 1910. In order to cool the fruits and vegetables in the car without unloading and with the smallest possible delay in transit, the railroad plants manufacture an artificial arctic storm and send the icy blast of air through the cars, reducing the temperature of the fruit from as high as 120 degrees to 45 degrees within four hours. Entire trains are pre-cooled at a time in this manner, the bunkers filled with ice, and started East in five hours, the fruit as cold as it was formerly only after the plains beyond the Rockies were reached.

dium, the air, below the freezing point, while a static air can easily produce below-zero temperatures in unlimited quantities of air. These facts are simple, but despite their simplicity were overlooked until Professor G. Harold Powell of the Bureau of Plant Industry pointed them out after painstaking investigation. He likewise pointed out that the grower, by cooling his stuff immediately after packing, need not leave air spaces between the packages in the car, could safely load the stuff in a solid mass, and need not ship green deciduous fruits and unripe vegetables, ripening and decay being checked at once by pre-cooling instead of after three or four days under the old method of standard icing.

As soon as the importance of the pre-cooling method to the fruit industry of California had been realized and its practicability demonstrated, the Southern Pacific began the construction of two large ice and pre-cooling plants in the deciduous and citrus fruit districts of California, one of the plants being built at Roseville, near Sacramento, and the other one at Colton, in southern California, while the Santa Fe completed its San Ber-

The pre-cooling plant of the Santa Fe at San Bernardino, represents an investment of a million. It is built out of reinforced concrete, has a total length of a quarter of a mile and a maximum ice-making capacity of two hundred and fifty tons a day, with storage capacity for 30,000 tons. The arctic temperatures are produced in a large room containing thirty-five miles of pipe coils through which brine with a temperature below zero is circulating, cooling the air pass-

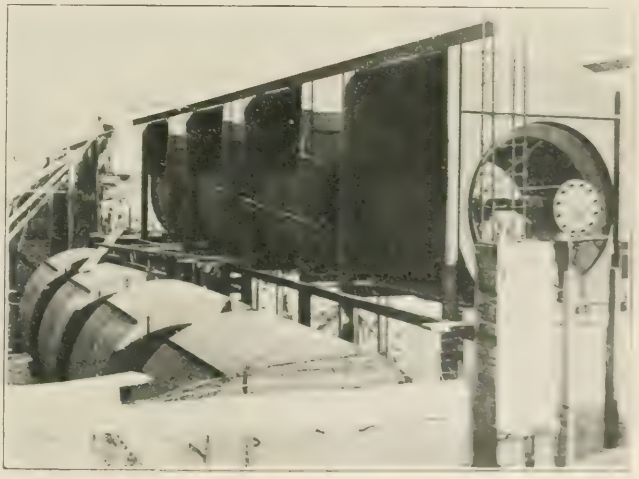
Flexible Couplings Which Convey the Cold Blast from the Tunnel to the Cars.
The cakes of ice travel on a movable platform.

CONSTRUCTING THE MAMMOTH COLD-AIR TUNNEL OF THE PRE-COOLING PLANT AT COLTON.

ing over it far below the freezing point. A concrete tunnel six feet high receives the cold air which races through it at a speed of fifty miles an hour, driven by eight fans over seven feet in diameter. The concrete tunnel harboring the arctic storm runs for thirteen hundred feet alongside of a track with a capacity of thirty-two cars. The tunnel is tapped by sixty-four flexible couplings, one of which is inserted into the vent opening at either end of a car when the pre-cooling begins. After the warm air has been driven out, by a preliminary blast, the music of the zero cyclone starts. At the rate of eight thousand cubic feet a minute the blast whistles through the cars, impinging against the boxes and crates, feeling with icy fingers into every nook and crevice, taking a little of the fruit's heat with it and passing out through the second pipe to return to the brine coils. At the end of the first hour the blast changes its direction and enters the car from the other end in order to equalize the temperature throughout the load. Care must be exercised by the engineer in charge to gradually increase the temperature of the air as the fruit grows cold, unless he wants to change the interior of the car into a real arctic scene. It is on record that three carloads of celery were frozen stiff while the temperature was close to a hundred degrees — outside the car. Inside the zero air had been turned on too long for the tender vegetables and the railroad had to pay out fifteen hundred dollars for the engineer's pre-cooling experience.

The Southern Pacific pre-cooling plants employ an intermittent vacuum system instead of a direct blast, accomplishing about the same results in approximately the same time as the Santa Fe.

Pre-cooling is a profitable process. It saves ice, increases the weight of the paying load that can be stowed in a refrigerator car, widens the market of the producer by enabling him to ship ripe, fully flavored produce and extends the distance over which he may ship without danger of decay in the upper stratum. But into whose pocket shall the financial benefit flow? Who shall benefit by the saving in ice and the increased capacity of the car, the producer or the carrier? Over this question the railroads and the California orange growers are engaged in one of their periodic rough-and-tumble bouts, with first blood for the growers. The organized growers are using the pre-cooling process as a club to force a reduction in the icing charges, and they



EIGHT FANS AT THE PRE-COOLING PLANT
Used to drive ice cold air through the cars at hurricane speed.

are using this club so effectively that the demand will probably be complied with in part.

Though the orange needs pre-cooling less than almost any other perishable product, the original pre-cooling tests were made with orange shipments and two of the three large railroad plants are devoted primarily to the citrus traffic. The orange ripens so slowly that no green fruit is picked, and it keeps so well after picking that decay gains a hold only when the skin is cut or bruised. Orange shipments are iced chiefly to prevent decay in the fruit bruised in packing and to forestall the wrinkling of the smooth skin through excessive evaporation in hot weather. As the largest part of the crop moves during the cold weather of winter and spring, only half the shipments need icing, but, even with these advantages over deciduous fruits, it costs the growers a cool million a year to pay the ice man, who demands $62.50 per car to Chicago and $75 to New York on the plea that he performs the icing at cost. To escape these icing charges, two of the co-operative growers' associations, at Redlands and Pomona, built small pre-cooling plants at an investment of about $50,000 each. In these plants, they reduced the temperature of the oranges immediately after packing to 33 or 34 degrees, ten degrees less than the railroad practice, loaded the ice-cold fruit into the cars, filled the bunkers with their own ice and sent the cars off with instructions not to re-ice them at the dozen icing stations along the routes. Then they settled down in their chairs to figure out the profit they would make by escaping the payment of $62.50 per car for standard icing.

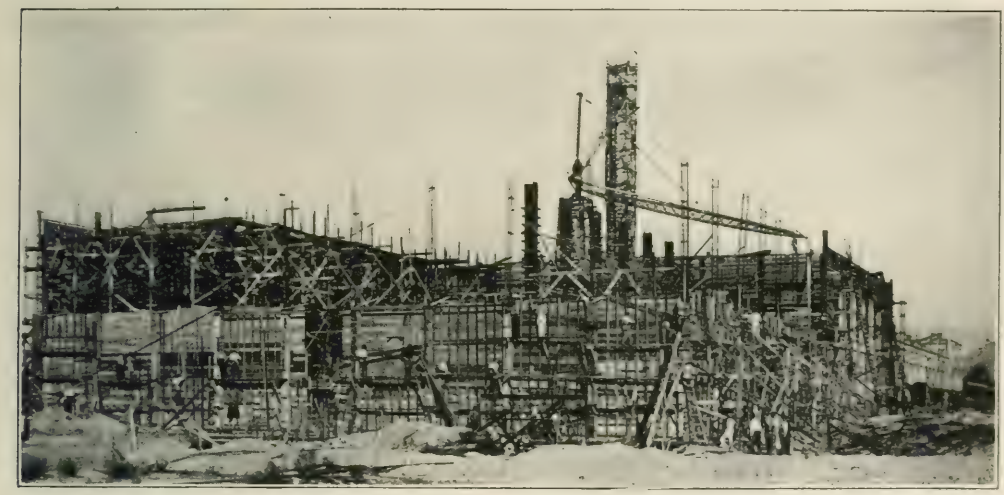
They found that the pre-cooling in their small plants cost them from four to five cents per box or about twenty dollars per car, the ice they supplied raising the total cost per car to $32.50. The saving of $30 per car looked good to the growers, and other associations were preparing to follow the example of the pre-cooling pioneers when the railroads closed the leak in their icing revenue with a tariff which imposed an arbitrary charge of thirty dollars on every car pre-cooled and pre-iced by the shipper, full standard icing charges to be paid if a single pound of ice had to be furnished by the railroads in transit. That tariff shook the profit out of private pre-cooling and discouraged additional private plants, but it did not discourage the growers. They appealed to the Interstate Commerce Commission, attacking the structure of icing charges from basement to roof and raising an especially loud howl against the thirty-dollar charge for cars that were supposed not to receive ice from the carriers at all.

The thirty-dollar tariff was imposed to centralize the pre-cooling business at the railroad plants which had to be run at capacity if they were to pay. Should the Commission abolish this tariff and

PART OF THE PRE-COOLING SHED AT SAN BERNARDINO.
Twelve cars are connected with the zero air system and cooled at the same time.

allow the shippers to do their own pre-cooling and pre-icing, the railroads will be confronted either by the necessity of reducing their charges for pre-cooling and icing to meet the competition of the growers' small plants or else run their plants at only a portion of their maximum capacity. The railroads, however, profess not to fear the growers' competition. The carriers maintain that it is impossible to send a pre-cooled car across the continent without re-icing, that additional ice must be placed into the bunkers on the way to protect the fruit and tage of it independently of the railroads.

It is unfortunate that dissension should have arisen in the ranks of the pre-coolers at the very outset. In the fracas between carriers and producers the infant improvement in the science of refrigeration is the chief sufferer, both of its eyes being blackened by the contestants who are busy minimizing the results obtained by the plants of either side in the fight for possession of the benefit. But nevertheless the practice of pre-cooling perishable freight will grow and spread. Its advantages are too obvious to be over-



THE CONCRETE PRE-COOLING PLANT OF THE SANTA FE UNDER CONSTRUCTION AT SAN BERNARDINO.

that, commercially, the small plants are not a success. The growers, on the contrary, point to the record of over a thousand cars sent out by them which arrived in good condition with a portion of the original ice still in the bunkers, though the railroads dispute the truth of the latter assertion. Whatever the outcome of the controversy, pre-cooling will tend to reduce icing charges wherever the shippers are strong enough to take advan-

looked by the interests affected. With proper pre-cooling facilities provided along the lines, practically every commodity shipped under ice could be handled by these plants to the advantage of producer and carrier as well as consumer, though the greatest stimulus will be given the shipping of fresh, ripe fruits and vegetables from isolated districts to the centers of population in the east.

"THE NARROWS," ENTRANCE TO SALMON BAY.
Where the Government will Build the Locks for the Lake Washington Canal.

THE LAKE WASHINGTON CANAL—A NATIONAL PROJECT

By

WILLIAM THORNTON PROSSER

IN the Rivers and Harbors bill passed by the recent session of Congress is an item appropriating something more than two million dollars for the construction of a lock that makes possible the opening of the Lake Washington Canal, a project that will give to the city of Seattle the finest harbor in the world. Considering New York's magnificent shipping facilities; the Thames and its centuries of maritime supremacy; Liverpool with its famous quays; and Hong Kong, exceeding all other ports in tonnage, Seattle, the youngest of them all, facing out upon the Pacific with its promise of commercial greatness, may well boast of the distinction she is about to claim.

For half a century Seattle, expanding from a log cabin settlement in the wilderness to a port of world consequence, has had constantly before her eyes the dream of the Lake Washington canal. Through depression and boom, in summer and winter, year after year, the city has stood committed to the project; rival schemes, counter propositions, private interests have risen as the foes of the canal again and again, but they have lost; governors and United States senators have been elected upon their pledge to further Seattle's great desire.

But at last the greater part of the battle is won, for under the terms of the proposition submitted to the government, the city of Seattle and the county of King will complete the actual construction of the waterway, the government taking as its share the building of the lock. This means approximately an equal division of the task. The Lake Washington canal, considering the dimensions as a whole, will have the largest lock in existence, save those that will be built on the Isthmus of Panama, while only one other in contemplation, and that

in Europe, will equal it in size or capacity.

Yet the cost of connecting Puget Sound with Lake Washington is trifling compared with the advantages accruing to Seattle and the nation from the opening of a "deep sea" fresh water harbor. Seattle's present commercial water frontage will be increased from perhaps ten miles to more than one hundred by the canal, opening the very center of the city to maritime commerce, while the United States Navy and all Pacific Coast shipping will be afforded a fresh water basin of 24,000 acres of navigable water, safe from enemy, storm, or salt water's destructive forces.

A glance at the map will show Seattle's peculiarly advantageous location with regard to Puget Sound and Lake Washington. Facing Elliott Bay, which opens to the west and north, the city backs upon the lake, while midway between Washington and the bay lies Lake Union, four-fifths of the connecting link. The junction of the two lakes by an open waterway, and the merging of Lake Union with Salmon bay, an estuary of Puget Sound, constitute the Lake Washington canal project. But instead of adjusting the fresh and salt water levels with a lock between Lake Union and Salmon bay, the plan is for the placing of the lock between Salmon Bay and Puget Sound, thus converting Salmon Bay into a fresh water harbor, raising it eight feet above the present level of high tide, and making it a valuable shipping basin.

It was George B. McClellan, later General, sent into the northwest before the Civil war began, who first suggested the creation of a protected harbor in Lake Washington. Those were the days of the boundary dispute between Great Britain and the United States over possession of the San Juan group of islands. On San Juan island an American pig, unmindful of the tentative international boundary line, almost precipitated hostilities between the opposing military camps—but that's another story. The McClellan mind conceived the idea of making Lake Washington a possible base of operations for an American fleet.

Strange it is that more than fifty years have elapsed since the canal was considered, and that today it is only begun, but local conditions and the failure of the national government to appreciate the importance of a project so far away from the national capital answer the question.

In the meantime another project had developed affecting the southern waterfront of Seattle. The Duwamish river tortuously wriggles its way for several miles across the low ground at the head of Elliott Bay. Property owners affect-

DIGGING THE LAKE WASHINGTON CANAL.

ed banded together, obtained consent from the state legislature for straightening the river and making it a navigable waterway, and are commencing work upon the project, a most meritorious undertaking that will add twenty-four miles to Seattle's harbor facilities, where many factories are sure to stand. This Duwamish project (which is in itself a million dollar undertaking), is not in reality antagonistic to the Lake Washington scheme, though an attempt was made to make it seem so.

But of greatest interest is the concrete and steel canal lock as designed by government engineers. Of the congressional appropriation $150,000 is immediately available for construction work. The lock will be of the most approved type, designed not only for handling the largest vessels that are engaged in the Pacific trade, like the Great Northern liner, *Minnesota,* but as well for receiving the big rafts of logs passing in for the use of the bay and lake mills.

According to the plans of the Engineer Corps, the lock will consist of two parallel chambers, one a diminutive affair intended for the reception of the "mosquito" fleet. This can be emptied and filled speedily without interference with the larger chamber, so economizing time and flowage. The larger chamber is to be divided unequally by a gate which enables the use of one section only for vessels too large for the small chamber alongside, and not large enough to require the entire space. This means that four lock chambers will be provided, the "mosquito" being 150 feet in length, the smaller section of the main lock being 350, the larger section 475, and the total length 825 feet.

SEATTLE HARBOR AND THE ROUTE OF THE LAKE WASHINGTON CANAL.

With this combination of chambers, traffic should be handled with the utmost expedition. The passing back and forth of the small craft will interfere in no way with the raising and lowering of the big ships. With a depth of twenty-five feet in both the canal and the lock, the ordinary "Dreadnaught" type of battleship can pass, and any sort of liner now in existence with the exception of the Lucitanias and Mauritanias of the transatlantic service.

Arguments against a larger lock and deeper canal are forceful. The time will come, undoubtedly, when ships of the Atlantic ferry type will visit Puget Sound, but the sound itself, and Elliott Bay offer such ample facilities in the way of a harbor that the immensely increased cost

EXCAVATION FOR THE LAKE WASHINGTON CANAL.

in deepening the canal and lock is plainly outside the pale of logical reasoning.' The canal is to be 125 feet wide at the top, and 75 feet wide on the bottom. The estimated cost of the actual excavation is estimated at one million dollars.

Ample flowage of water will be provided not only for the operation of the locks, but for a power plant as well, though the provision for such an auxiliary was stricken from the congressional measure. A part of the general canal plan is the diversion of the waters of Cedar river, from the headwaters of which comes Seattle's magnificent water supply, into Lake Washington, freshening waters now tending to become stagnant, and giving the canal the flow from virtually six hundred square miles of watershed.

Entrance works to the canal from Puget Sound, to be built by the government as part of the lock contract, will consist of piers or breakwaters extending out half a mile from the shore, and with an opening five hundred feet wide at the deep water line. An idea of the size of the completed lock may be gained by comparing it with four blocks of a city street, lined on either side by five-story buildings. Concrete will be the chief material used in the lock and its approaches. The lock at mean sea level will have thirty-six feet of water on the lower sill, and the lift will be twenty-two feet from mean low water to high water in the canal.

Estimates of time required for the completion of the canal with all its appurtenances are in the neighborhood of three years. The Secretary of War is given authority to begin the government work as soon as he is assured that local agencies will carry forward the canal construction. The Rivers and Harbors bill aside from making $150,000 immediately available, authorizes contracts covering the remainder of the appropriation. Settlement of legal questions affecting the assessment district formed by the people of Seattle and King County, together with the fact that $250,000 is now being expended upon excavation, will doubtless satisfy the Secretary of War that the government may proceed with its end of the agreement.

Several most important benefits that the canal will accomplish have not been more than hinted at. One of the most notable of these is the diverting of the Cedar river flow into Lake Washington, by way of Black river, which is a sluggish stream connecting the river and lake. Each year thousands of dollars worth of property is destroyed to the south of the lake by the overflow of the various streams in that vicinity. Homes are ruined and agricultural land is despoiled. The problem of protecting the many people affected and of freeing the rich land of the flood curse is one of the most serious before the authorities of King County. The lowering of the lake level twelve feet, and the changing in the courses of the different streams will modify conditions so completely that the problem will be solved.

By the raising of Salmon Bay's level and the lowering of Lake Washington's, sanitary conditions will be greatly improved. Acres of tide flats will be ren-

SALMON BAY. LOOKING EAST FROM THE NARROWS. BALLARD IN THE DISTANCE.

dered into harbor area, and great tracts of swamps at both ends of the lake will be reclaimed.

Five great advantages are given by Capt. Archibald O. Powell, United States Engineers, as possible through the opening of the canal. They are:

The creation of a vast and unique fresh water harbor.

The extension of water transportation through and into the center of the city, and along its western boundary.

The betterment of sanitary conditions around Salmon Bay and the two lakes,

The reclamation of extensive swamp areas along the border of Lake Washington, especially at the north and the south ends.

The opening of manufacturing sites.

The wonder is that Seattle has not taken advantage long ere this of the opportunity at her door, but Seattle has not long been a community of sufficient size to carry forward even half the burden of such an enterprise. Ten years is not long in the life of a city, and yet ten years ago Seattle had a population of only eighty thousand people. The decade has seen a growth to a quarter of a million, a record that can scarce be duplicated in the history of American cities. And then, until Seattle became a

BALLARD—A SUBURB OF SEATTLE ON SALMON BAY.
Said to be the largest shingle manufacturing point in the world.

great port her harbor facilities were ample. Puget Sound, with its estuaries and inlets, has a shore line of one thousand miles. But certainly no city could ask for a more magnificent harbor than Seattle will be provided with when the Lake Washington Canal and the Duwamish waterway become realities. New York's thirty miles of waterfront will look small compared with this western city's 130 miles.

But the building of the Lake Washington canal has a national significance. Its opening has been called for by the lawmakers of all the West, who have seen its advantages to Pacific Commerce and as a strategic step in the control of the world's largest ocean. The entire country sees in it a forward movement in preparation for that conflict that is so often predicted between Oriental and Occidental aggression. The Lake Washington Canal, though a Seattle project, will belong to the American nation

THE DITCH BETWEEN LAKE UNION AND SALMON BAY.
This will be enlarged to become part of the Lake Washington Canal.

A LESSON IN CORN JUDGING.
Conducted in one of Miss Field's country schools by an expert from the State Agricultural College.

RAISING A CROP OF YOUNG FARMERS

By

F. G. MOORHEAD

WHEN Martin was nine he swore like a steamboat mate, smoked like a "why pay rent" installment house furnace, and prided himself on the fact that he could expectorate a stream of tobacco juice further and with greater precision than his father. His garb consisted of an old pair of his father's trousers—one leg reaching to the ankle, the other stopping short at the knee—precariously hitched up over his ragged shirt by means of "galluses," his freckled face topped by a weather-beaten hat the chief feature of which was a jagged rent through which the tousled hair jabbed its perpendicular way. His sole occupation consisted in warning the men at the still of the approach of officers.

When Martin was fifteen he ranked fifth in a class of eighty farm boys entered in a corn judging contest. He could plow a straight furrow, make a germination box, test the seed corn, calibrate the planter, and plant a field to corn as well as any boy in the county. Socially he was eligible to attend the neighborhood "sociables" and "parties" and receive letters at those rapturous games of "postoffice" which determined the social standing and personal popularity of the boys and girls of the neighborhood. Sartorially, he was still deficient a "boiled" shirt and patent leathers, but was able to hold up his head in the school photograph and not be conspicuous by any sins of omission or commission.

What brought about the change?

At the age of nine Martin quit the Tennessee mountains which had been his home and accompanied his parents to the Promised Land in southern Iowa. For two years he helped his father work out for the prosperous farmers of Page county and pack the household goods and gods on the decrepit and creaking old wagon on their frequent hegiras from one place to another. As a rule, father and son hesitated about a month and then moved on. Twice they essayed

tilling rented land for themselves, twice they failed. When there were no jobs to be had Martin attended the country schools. He learned his letters and gradually came to have a hazy, indistinct sort of knowledge concerning the chief products of Baluchistan and the principal occupations of the people of Bulgaria.

There is no denying that Martin made life miserable for his teachers in those early days. And yet before the first year of the Iowa residence had passed, he expressed a willingness to be corrected in his misdeeds and made over into at least a semblance of a civilized country boy.

It was the flowers, however, which began the making of the new Martin. He had never seen such beautiful things in all his life, he had not imagined they existed. He scoffed that day when the County Superintendent drove up in her buggy and told them the news. It didn't seem to him to call for the excitement which was visible in the Superintendent's manner and quickly spread to teacher and scholars. Somebody had given the Superintendent 6,000 tulip bulbs and she proposed to distribute them among the 3,000 rural scholars of the county, letting every boy and every girl plant two, tend them, and have the plants and blossoms all for their own. Her eyes sparkled when she described the scene with all the bulbs blooming and the place about the hitching rail in the front yard turned into a blaze of floral beauty. Martin didn't take much stock in the plans, but he took the two bulbs, having been brought up to accept everything that was free.

Now, this is the wonder of the tulip bed, told by the County Superintendent who distributed the bulbs: "The boy who appreciated the tulips most was Martin. When I visited that school some time later, down on his knees by the flower bed he dropped, his straw hat by his side and touching almost reverently a great crimson blossom he said: 'See, this one is mine. Isn't it the prettiest one of them all?' I was not surprised when his teacher said to me, very quietly so that he might not overhear: 'Martin does not swear or use tobacco any more.' There was the secret: the boy who learns to love one beautiful thing has no longer any room in his heart or soul for impurity or vice. The picture of that boy, in his blue overalls, with his straw hat at his side, the morning sun touching with gold his tousled hair, as he bent lovingly over those bright flowers and touched them so gently with his brown hands, will be with me always."

It had remained for this Superintendent of Schools in Page County, Iowa, Jessie Field by name, to reclaim that boy through the medium of a tulip bulb. It has been given to her to start a great work with many another Martin and many a Martha who might otherwise have been tempted to the great white way of the city, a work which has been so eminently successful that it stands as an object lesson and an example to every other worker seeking to solve that most important problem: how to keep the boy and the girl on the farm.

"I'll admit I am partial to my boys,"

A Page County Boy Judging Corn Under the Supervision of an Interested Farmer.

A Corner of the School Room.
The bookshelves contain an excellent library.

Modern Farm Homes Abound in Page County. Miss Field believes in making the school-house keep pace.

confesses Miss Field. "Somehow it has been that way all the time. I have thought out plans to keep them on the farm, to interest them in farming, to make real country schools for the country boys so that they would not need to go off to town or city and be lured away from the farm which needs them so badly. I like the girls all right, but I love my boys. And, oh, they meet me so grandly, always more than half way; eager faced, anxious to learn, just hungering for somebody to make schooling practical and attractive to them. We have had too much in the past of the products of Baluchistan and the industries of Bulgaria; I have set myself to making real country schools which shall meet the needs of real country people and teach them how better to do the work that lies ready to their hands."

When Miss Field took charge, four years ago, she found the country schools in what passed in those days for good condition, but she believed there was much she could do and she set to work with a will. First of all, she made a trip through the county inspecting its 130 rural schools. She found school grounds without trees and without fences, school houses without paint, sometimes with holes in the foundation, dingy walls and other signs of neglect. Always she drove to the summit of the nearest hill and looked about her. As far as the eyes could distinguish she saw fields of waving grain, dotted here and there with feeding herds. She saw great, red-painted barns bulging with the harvest's yield. She heard the click and whirr of machinery and saw on every hand the material evidences of continued prosperity. She saw farmhouses which had been modernized to the extent of bathtubs and water-under-pressure systems, furnaces and lighting plants being installed. She saw new farmhouses costing $5,000, even $10,000, and in their rear the old, unpainted, and unsanitary homes which had sufficed until prosperity and progress had done their work. But seldom did she see new, modern, sanitary, and sightly school houses supplanting the old buildings. As Miss Field drove slowly down from each hill summit she made a mental resolve, which gradually crystallized into a campaign slogan:

"The farm school must keep pace with the farm home."

Her first step in the campaign was simple. She purchased a good camera with which she took pictures of the school buildings, inside and outside. She believed the photographs would show contrasts which would open the people's eyes. She enlisted the co-operation of the local editors and week after week there appeared, in the columns of the home newspapers, pictures of neat school houses and run-down ones, school houses with trees and without, coal houses well built and poorly built, school interiors which were attractive and elevating and those which degraded the minds and were in a fair way to stunt the growth of the bodies. The pleasing views invariably bore a label which identified them. Miss Field was gracious enough not to identify publicly the ones which showed a run-down condition. She quickly observed, however, that the people recognized the different views. The patrons of the poor school houses began to hang their heads. They did not show anger; they were rebuked and were sorry. The patrons of the good school houses began to boast and thus gradually the spirit of contest, of natural, healthy competition, grew up in the county. Tumble-down coal houses disappeared; hitching posts and rails in the front yard became conspicuous by their absence; flowers began to bloom where the horses had pawed the earth into holes in which the water greened and mosquitoes bred; daubs of fresh paint blotted out the obscene phrases and because these daubs were conspicuous the entire building was repainted; trees were planted and gradu-

ally came to cast a shade, earnest of that greater shade which the years would bring; the school houses, inside and out, began to keep pace with the farm homes.

With the work of beautifying grounds, outbuildings, and exterior well started, Miss Field devoted her attention to improving the interior of the school houses and making more practical the courses of study. The bare and frequently time- and soot-stained walls were given a soft tint, restful to the eye. The old desks were displaced with new and comfortable ones. The tottering shelves were thrown out and sectional bookcases installed. The out-of-date drinking bucket and its single tin cup were thrown away and in its place, in two-thirds of the schools, Miss Field installed a basin, with a drain pipe leading to the outside, and individual drinking cups. The adoption of these cups was considerable of an innovation, but when the danger which lies in the public drinking cup was shown, the school patrons were quick to meet Miss Field more than half way. In many instances the children brought tin or earthenware cups from home. In other cases little entertainments were given, the profits being devoted to buying collapsible drinking cups for each member of the school. In one case the teacher hung a drinking cup for each student on the school Christmas tree. Whatever the method of securing them, the result is that 75 per cent of the 3,000 rural scholars of Page county today have individual drinking cups.

An annual clean-up day was next in order and Miss Field set Arbor Day for this necessary function. Each year the schools organize for this, the hours being spent in carrying away cinder piles, raking the yard, planting seeds, vines, and shrubbery, and thoroughly scrubbing and cleaning the house. The experience of one of the teachers is typical:

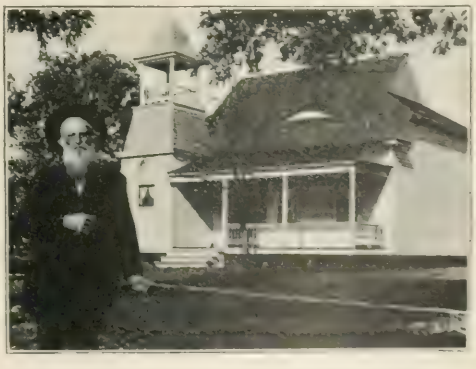
"When I took this school in the fall of 1907 I found very little to inspire one to make much effort in trying to beautify the surroundings. I soon learned why so little had been done to improve them. There was only one-half acre of playground and a dilapidated wire fence on three sides, with the front unfenced. There was no means of protecting things. They said the playground was too small to plant any trees and leave enough space for the pupils.

"The county superintendent, myself, and two of the directors set the ball rolling and before the next year had passed the school board had purchased one-half acre more, put up a splendid woven-wire fence, remodeled the closets, moved the coal-house which had always stood partly in the road, dug a well, put in a new iron pump, painted the school house, and planted twenty-two elm trees.

"When I came there was practically nothing on the grounds but the school house, coal-house, and outbuildings. Where I found cinder piles there are now blooming beds of flowers. Many of the mole-hills are converted into flower beds, too. The yard has been raked and trash carried away. The parents generously gave what they had. One parent even came and put things out for us and tended to them in the summer when needed. Another parent sent some rose bushes. They used to have rings in the school house, and teacher and pupils tied their horses there to protect them from the wind. Near one of these favorite hitching posts we have a fern bed now.

"Inside we kept the house clean. It has been scrubbed five times this year. Through the efforts of the school a sectional bookcase, a dictionary and shelf, shades and draperies have been added. The room was always clean, and the stove black."

When the work of improving physical conditions was well under way Miss Field breathed a sigh of relief—and took up the real work to which she had set



Type of School House in Page County. Sanitary, Modern, Attractive

herself. She was a farmer's daughter and knew from experience as well as by observation that while many a boy and girl knows arithmetic in the book, he or she cannot figure up the scale tickets or the milk checks at home. She remembered the old days when she had herself asked "Do you 'times' it or is it 'into'?" She could have worked the home problem assigned her by her father if it had been in terms of oranges, but it happened to be corn or potatoes and she was as dumb as the proverbial clam. Also she knew that too much of the common school education bore the "made in Germany" label; she proposed to patronize home industry.

Miss Jessie Field, President W. C. Brown of the New York Central, and the Three Page County Boys Who Won the State Judging Championship.

Today the visitor to the Page county schools will not hear many recitations about Bulgaria, Baluchistan, or Mesopotamia, but he will find the boys and girls, their faces eager and shining, at work over a Babcock milk tester or a seed germination box, reading the experiment station or the department of agriculture bulletins which are to be found by the dozens on the library racks, judging corn, testing seed, studying weeds and insects, and solving problems expressed in homely, every-day terms with which they are perfectly familiar. The boy and the girl who could do it in oranges, if they were told whether it was "times" or "into," now has to solve daily arithmetic problems such as the following:

"Suppose a 40-acre field planted to corn for five years in succession produced sixty bushels per acre the first year, 55 the second, 43 the third, 33 the fourth, and 30 the fifth. What will be the value of the corn grown in the five years at 40 cents per bushel?"

"Suppose, instead of growing corn continuously, the following rotation were practiced: First year, 40 acres of corn. 60 bushels per acre at 40 cents. Second year, 40 acres of oats, 60 bushels per acre at 30 cents. Third year, 40 acres of clover, 3 tons per acre at $8 per ton. Fourth year, 40 acres of timothy, 2 tons per acre at $9 a ton. Fifth year, 40 acres of corn, 70 bushels per acre at 40 cents per bushel. Find the value of the five years' crop."

"Which of the two plans would produce the most money in five years? How much more? Which would leave the land in the best condition at the end of five years? Are there any other advantages to either plan?"

"As destroyers of potato beetles and other harmful insects, a single pair of quail is said to be worth $5. If this pair produces a brood of sixteen young quail, what is the value of the work done by the entire covey next year?"

Such problems, worked day after day, with practical object lessons always before him, were factors in the reclamation of Martin and made an alert, practical farm boy out of the Bulgaria-confused parrot-blockhead of yesterday. The effect has been noticeable in the homes as well as in the schools. Miss Field narrates this actual experience in her county. Farmer A wanted to buy a stack of hay from Farmer B, but they could not agree as to the amount of hay in the stack and neither had a reliable rule for computing it. A needed the hay very much and when he went home at night

he looked tired and worried. At supper his wife noticed this and asked what was the trouble. He replied, "I can't make a deal for the hay with Neighbor B. We don't agree as to the amount in the stack and we have no rule by which we can tell the number of tons in it. I won't pay for more than is there and he is afraid he won't get pay enough and so it stands." The bright-eyed son looked up eagerly. "Pa, have you the measurements for the stack? Is it wild hay? Let me have them. We learned just last week at school how to measure hay in the stack." So the number of tons were computed—the farmer and the farmer-to-be—with heads close together over the paper. The telephone rang up Mr. B and the deal was made that night. "That farmer decided anew that the taxes which he paid for his school and its good teacher were the best investment he had ever made," comments Miss Field. "Down at that school his boys and his girl were securing knowledge they would need to use when they were on farms of their own so that no one could take advantage of them or pull the wool over their eyes in a business deal."

INDIVIDUAL DRINKING CUPS ARE USED BY TWO-THIRDS OF THE 3,000 COUNTRY SCHOLARS OF PAGE COUNTY.

One of the things of which Miss Field is most proud is the formation of a Boys' Agricultural Club, to which every farm boy in the county is eligible. Not only are the boys instructed in corn testing, planting, and judging, but county contests are held, for which prizes are offered by the local merchants. The boys bring in the best ears of the corn they have raised themselves, or that their fathers have raised, and these are tested and graded, the youthful judges telling why they arrive at their verdicts. How successful these local shows have become is evidenced by the fact that last fall the Page county boys took first in every class in corn for Iowa at the National Corn show held at Omaha, while the county exhibit as a whole won first place, securing as a premium an automobile, which, by unanimous consent of all the exhibitors, was turned over to Miss Field in order that she might more readily and frequently visit the various schools of the county. A member of the Boys' Agricultural Club won the grand champion sweepstakes at the Iowa state fair in 1909. Altogether the boys of the club won prizes, during the past year, amounting to over $1,500.

The achievement in which Miss Field and the club members take the greatest pride was the winning of a trophy for the best boys' corn judging team in Iowa. Miss Field tells the story dramatically in this manner:

"We had conducted two classes in corn judging for the boys on Saturdays in the fall of 1908, with experts from our state agricultural college in charge. At our County Farmers' Picnic, which is held each year in August at our agricultural experiment station in our county farm, we announced a boys' competitive corn judging contest. Now this picnic had never in former years been very well attended, but last summer early in the forenoon automobiles and buggies began to roll in from all parts of the county. Each vehicle contained one or more boys who hurried to the big barn to get their number assigned for the contest. It was a banner crowd—the biggest that ever attended a County Farmers' Picnic in this county. It was like the biggest day at the county fair. All day long the boys' corn judging contest continued. The boys placed the first five ears in the samples and gave oral reasons for their placing. One of the farmers who helped was busy all day adding up scores. While one of the men from the state agricultural college talked to the crowd,

the other one took charge of the boys. When night came the rush had been so great that we were not sure which three of the boys were the strongest, so we selected the twenty scoring highest and told them to come in November for a final contest.

Flower Beds Have Given to All an Interest, Aside from Books, Which Makes School Work More Attractive.

"They were all present on that Saturday in November and a senior student from our state college was in charge. In the meantime every boy of the twenty had been furnished with considerable material on corn judging and had studied it. In the evening after the chores were done you might see one of these boys bring some corn in on the sitting room table, pull down a book or two and some bulletins and score cards from the shelf and the father and the big brother and the hired man as assistants, dig deep into the points of corn judging. And the mother removed the corn to the top of the pantry the next day and didn't say a word.

"On the day of the final contest one boy arrived at nine o'clock quite out of breath and much worried for fear he was too late. In the afternoon he casually remarked that as he had no other way to come he had walked the twelve miles and it took a long time. He came in fourth in the contest.

"At this final contest, besides the work in judging, the boys were given a written examination on corn. The three boys scoring highest in all their work were selected to represent the county at the state contest. As it happened these boys lived in different parts of the county and were fourteen years old each. They are real country boys and know what it means to grow corn as well as to judge it.

"It had been promised that the three boys composing the county team should have all their expenses paid to attend the short course at our state agricultural college in January, at the close of which the contest for the trophy was to be held. How these expenses were to be paid was the next question. The matter was explained to W. C. Brown, President of the New York Central railroad, who owns a fine farm in Page county, and by return mail came his check to cover their expenses together with words of good cheer and belief in the worth of the work they were doing. His advice to the boys was, 'Stay on the farm; it will be the best business in the world.'

"So the boys went to Ames and the rest of the story is just that of the hard work and grit by which they won the splendid trophy as the best boys' corn judging team in the state."

Last summer the boys and girls not only had their clubs, but a summer camp was held in connection with the Chatauqua assembly and all the pleasures of camping were commingled with instructive lectures by members of the faculty of the state agricultural college. Miss Field is careful to remember that "all work and no play makes Jack a dull boy" and has been as diplomatic as Tom Sawyer when he induced his playmates to whitewash his aunt's fence for him. She has made fun out of work, pleasure out of study, and by infusing the element of competition has added a dramatic touch to a system of education which is rapidly becoming the model for the agricultural belt. The past summer her schools were visited by a party of southern educators, among whom were the superintendents of public instruction of twelve states. The party marveled at the practical knowledge and all-around proficiency of the scholars, but as the day passed there grew up in the minds of some a fear that the "eternal boy" might have disappeared in the precocious, practical farmer. How this fear was dispelled is best told by a newspaper reporter who accompanied the party.

"At the next school, after listening to a drill in vocal music and some pretty kindergarten motion songs, one of the

boys was called upon to give an example of corn judging. Frank Johnson was his name. He was fourteen years old and a bright country boy with open countenance and blue overalls. He had a basket of ears of corn which he went through and minutely differentiated. Watching his skill it was easy to understand why he is one of the three champions of the county, and has won a short course at Ames at the Iowa Agricultural college, as a prize. Frank was a little bit embarrassed during the first part of his exercise, but when the questions began he was aroused to a superb forgetfulness of self. He told those men exactly how to raise corn, from the time the grain was first selected in the spring until the best ears were chosen for seed corn in the fall. When they tried to get him to say that this ability was learned at school, however, he said he learned it of his father, and Miss Field beamed approval. She wants the school to create the interest, but the father to direct the work. That Frank and his father were full partners was illustrated by his answer to the question "What variety of seed corn do you use?" He said, "It is a kind we developed ourselves sixteen years ago." Then there were questions as to his other studies, and finally as he was about to take his seat one educator asked Frank "How do you like grammar?" "Well," Frank hesitated, "well, just fair," and so he was only a human boy after all.

The Boys Love the Tulips as Much as the Girls Do.

The work of Miss Field has borne fruit grandly. Not only have the boys and girls been interested and the movement to the town school stopped, but the parents have begun to drop in to the school houses to read the farm papers and bulletins on the racks and to absorb (always with an air of looking on) useful knowledge of which they are themselves in need. "You know a farmer will never come out and say he wants to learn a new thing," comments one who now admits his interest was selfish, "but if he can look over the fence and see it he will sneak home and try it on the back forty." All over Page county farmers are secretly trying what their boys have learned and taught them. They are honest enough to give credit where it belongs, once the secret experiment has been made and success has crowned their tentative efforts. And the mothers are learning, too, for while Miss Field is partial to the boys she is teaching the girls to sew, to test milk, to raise poultry, and to cook good, wholesome meals. The southern educators were treated to a true country dinner of fried chicken, mashed potatoes, and all that goes with these, cooked and served in one of the school houses by the girls of the domestic science department. They picked the bones clean, polished their dishes empty, and asked for more. Nor could their appetite be attributed solely to the weather and the drive along splendidly dragged roads, past rolling fields of grain and through a countryside of general contentment and prosperity. The girls are coming to be culinary artists. When they grow up they will not feed their liege lords on soggy potatoes and sodden biscuits. They will do their share toward keeping the boys and girls on the farm by giving them wholesome, attractive food, served daintily, amid artistic surroundings. The boys and girls are beginning to see the error of the ways of those who were tempted to the city before the new order of things had come about in the country. Miss Field recently offered prizes for the best essays on the subject "Why I Like to Live on the Farm." A girl won the first prize in this manner:

"I like the farm because we have good fresh air to breathe. We have pure food to eat and know it is pure because we raise most of what we eat on the farm."

THE FOREBAY OF THE GATUN DAM.
In the foreground are the steel forms for the conduits for filling the locks. The conduits are formed in the side and center walls. The forms are collapsible steel cylinders.

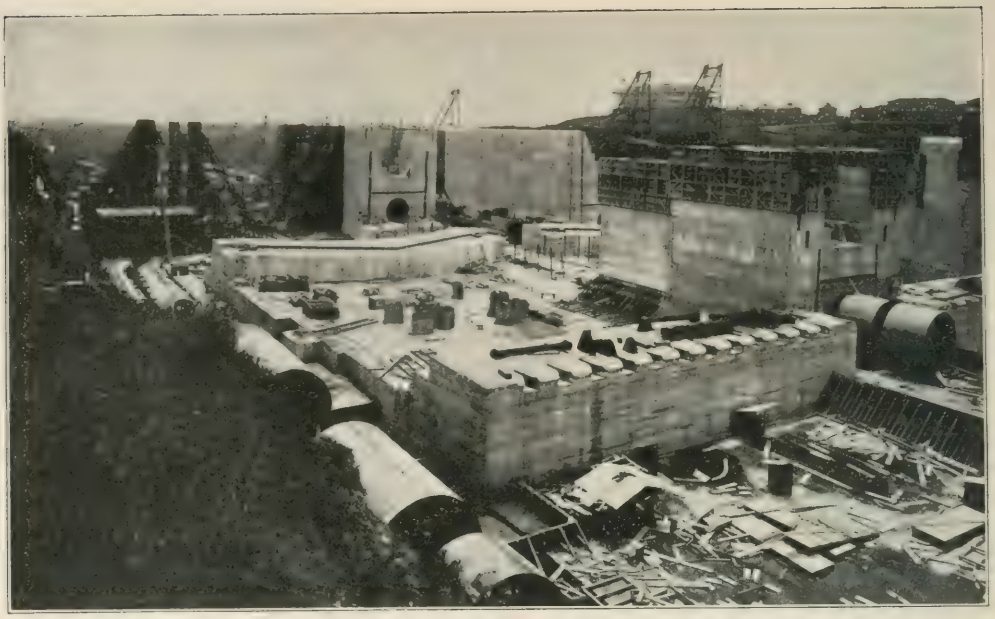
THE PEDRO MIGUEL LOCKS.
Material handled by the carload here.

AUTOMATIC APPLIANCES DO MOST OF THE WORK.
At the right of the upper view is shown one of the towers of the Gatun handling plant taking buckets of concrete from an electric train.

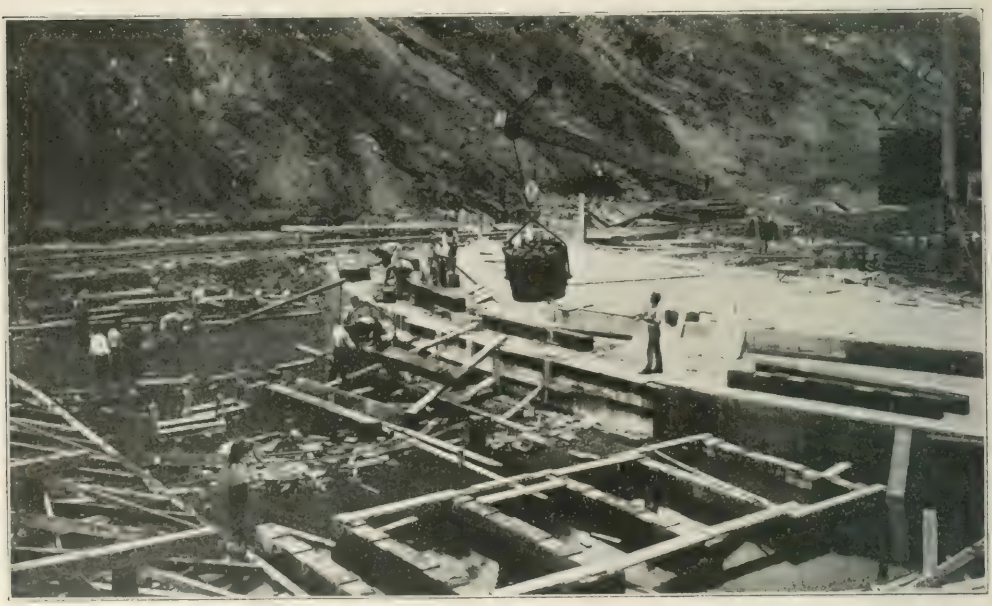
BUILDING THE GATUN DAM.
The side walls are 3,800 feet long and are built in sections between plate steel forms.

THE UPPER LOCKS OF THE GATUN DAM, SHOWING THE FLOOR.
The holes in the floor are four feet in diameter.

THE MONOLITH STEEL FORMS USED IN CASTING THE CONCRETE WALLS
The wall is built in sections and the forms are moved on a wide-gauge track.



BUILDING THE UPPER LOCKS OF THE GATUN DAM.



THE CONSTRUCTION OF A GATE OF ONE OF THE LOCKS OF THE PEDRO MIGUEL DAM

BOTH STEEL AND WOOD FORMS ARE USED AT GATUN.
In the upper view the forms on the left are steel and those on the right are wood.

PROSPECTING IN AN AUTO-PULLMAN

By

CHARLTON LAWRENCE EDHOLM

THE old-time desert prospectors who led their patient burros over the mountains and alkali plains of the southwest are getting a sight of real twentieth-century prospecting when they meet the palace car on pneumatic tires in which Mr. H. W. Larsson and his wife are searching for mineralized lands in California and Arizona.

This car has been variously described as a motor-pullman and as an automobile house, and in this up-to-date conveyance the owner can travel far from the railroads, making his own roads where necessary and carry with him all the comforts of home.

It is stated that Mr. Larsson purchased only the wheels of the car in the manufactured state; for every other part he has drawn the plans, made the patterns, and superintended the casting and building. This modern camp house is complete in every detail. It is thirteen and a half feet long and four and a half feet wide, and is about seven feet high. The appearance from the outside is very neat, as it is painted green, with green curtains at the windows. The front of the car is so arranged that it can be

READY TO START ON A PROSPECTING TOUR

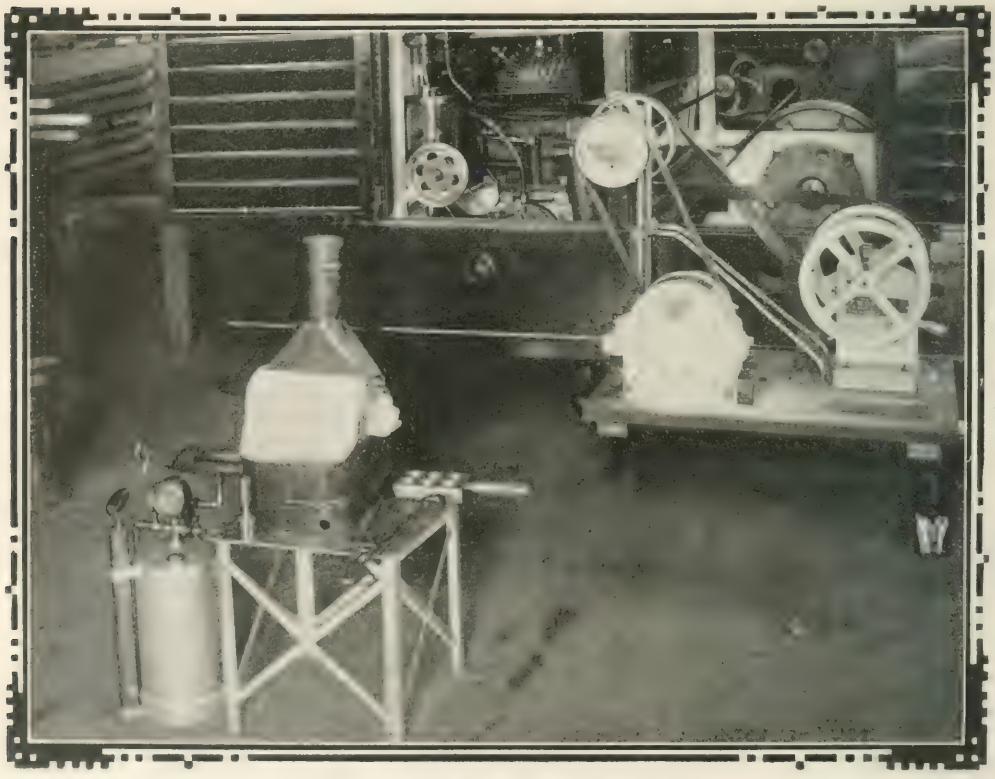
opened, or entirely closed, with glass windows.

The interior is wonderful, not one inch of space being wasted. Fitted into the walls are shelves, a mirror, a medicine cupboard, a desk that can be opened out, a dish cupboard, drawers for silverware and cooking utensils and provisions, a little gasoline stove for cooking and water tank with faucet, a pumping plant for drinking purposes where the water travels through chemically cooled pipes affording ice water in the hottest weather. Fastened to the wall by hinges is a good sized table for two, which when not in use is folded up out of the way and encloses the stove and other accessories of the culinary department in a tight cupboard. In the farther end of this remarkable little room are two beds, which in the day time are folded up very much like Pullman berths. The room has electric lights operated from storage batteries.

In the machine shop in the lower part of the car are stored forty gallons of gasoline and forty gallons of water. The engine is Mr. Larsson's own build; it is a three-cylinder, two-cycle engine of thirty-three horse-power, with double friction drive geared very low, the speed being not more than fifteen miles an hour.

In order to assay his ore finds without loss of time, Mr. Larsson has a complete assaying outfit, comprising an equipment of pulverizers and crushers in miniature and run by the automatic engine. Wherever a trace of gold is discovered, the crusher and smelter can determine its value in less than an hour.

Aside from prospecting, Mr. Larsson intends to place about two hundred and fifty guide signs along his route of travel. These will show the number of miles from one place to another and will be absolutely accurate, as the distance will be determined by the speedometer on his automobile. These will be a boon to every prospector and traveler in that



ORE CRUSHER AND ASSAY OUTFIT.
Auto engine operates crusher.

region, as they will give him accurate information as to the distance from water-holes, towns and different cross-roads centers and perhaps will be the means of saving many lives.

The equipment carried by this twentieth-century prospecter consists of a complete mining plant in miniature. It includes a steel frame crusher, a pulverizer, and a rotary flame combination furnace with burner and tank outfit. It is all equipped to do actual work and is operated by the motor of the automobile.

As the construction of these machines is identical with that of the full-sized ones, the merits of these appliances will be demonstrated to assayers.

IS MARS BREAKING UP?

By

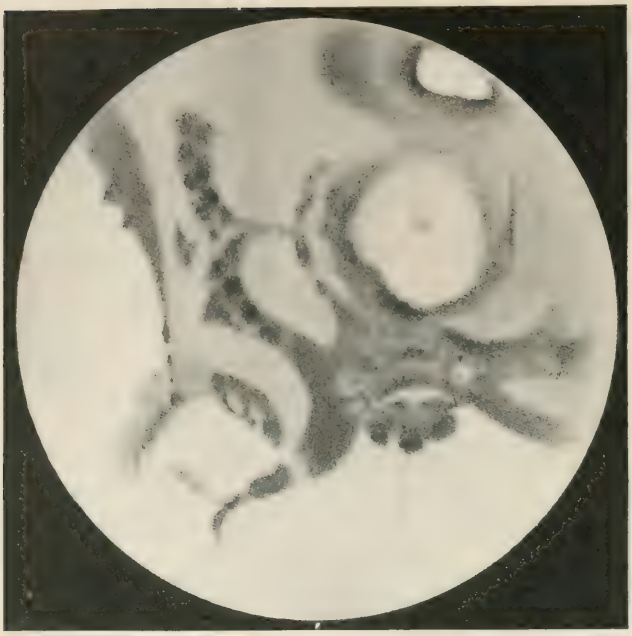
CECIL BEMBRIDGE

THE planet Mars is the cause of warfare. Astronomical science is divided into two camps. Professor Lowell, as the result of his remarkable investigations at Flagstaff, Arizona, where he has a magnificent instrument for observing this mysterious planet, while other conditions are favorable to a unique degree to permit of its study, maintains that the Martians are engaged in a fierce fight with nature for their existence and are energetically constructing huge canals to lead the water melted at the poles to the arid wastes upon which they depend for their existence.

The observers of other countries fiercely combat this contention, and now even go so far as to say that Professor Lowell is laboring under delusion. This opposite contention is not put forward by an individual observer, but is supported by many of the leading living astronomers of the world. The great Schiaparelli, who is probably our best authority on the subject of Mars, and who in spite of the limited facilities at his disposal for carrying out his planetary study, has accomplished remarkable work in regard to the detail of the planet, does not uphold the statement that the peculiar network which he first observed and committed to paper are really canals. He called them "canalli," meaning channels; hence the confusion. Professor Lowell is also contested vigorously by Mr. Maunder, the well-known English astronomer; Sir David Gill, Mr. A. Stanley Williams, a well-known English observer; M. Antoniadi, of Paris, and others.

MARS IN ITS RELATION TO THE EARTH.

Professor Lowell's work is universally admitted as being of invaluable importance, and his maps conceded to be the most accurate and detailed that have yet been presented to us of our nearest planetary neighbor, but the purport of the geometrical markings is bitterly controverted. Maunder and An-



MARS, AS SEEN FROM THE MEUDON OBSERVATORY, IN FRANCE.
This is one of the clearest drawings ever made of the planet.

toniadi argue that the geometrical "canal" network is an optical illusion; that they are not canals at all but complex shadings. This theory has always been maintained by Maunder and he adheres as firmly to his contention today as he did fifteen years ago. When observing the planet some time ago by means of the 28-inch refractors at the Greenwich observatory Maunder failed to see any markings whatever. And what is more to the point the observations recently made at the great Meudon observatory, near Paris, tend to support this conviction. Then again Lowell recently stated that his investigations served to show that the Martians were redoubling their efforts to avert the inevitable annihilation and that the so-called canals were in duplicate. On this point he is flatly contradicted by the observations at Meudon for here the markings were shown to be single lines only.

What then is the condition of Mars? What is happening on this remarkable planet? During the past year, when the movements of this celestial body brought it nearer the earth and in a more favorable position for study than has prevailed since 1892, it was the focus of all the great telescopes of the world. What was the result? Those stations which were favored by clear atmospheric conditions witnessed a great change in the appearance of this unit of the solar system. The observations witnessed at Meudon revealed a most remarkable phenomena, and absolutely without parallel in the records of the past. Vast tracts of the planet's surface were obscured by a strange veil which obliterated all the markings. What had happened? On this point science is silent. It cannot venture a definite opinion. Has Mars been visited by a catastrophe, more terrible, more devastating, and more extensive in its effects than any cataclysm which has visited our earth? Has the struggle of the Martians, supposing human life existed, been ended forever? Is the planet breaking up? Such are only one or two of the many questions that have been raised to explain the remarkable circumstance.

Certain it is, however, that something untoward has happened to the planet, and the peculiar effects have been described at length before the British Astronomical Association by Monsieur Antoniadi, who observed the phenomena through the telescope at Meudon which was placed at his disposal by Dr. Deslandres, the eminent Director, and who himself secured some striking maps. It may be explained that the observatory at Meudon is probably one of the finest equipped in the world—certainly it has the most powerful instrument in Europe. It is a 32.7 inch equatorial, and it has the vital feature of having no spherical or chromatic aberration troubling the image of such a difficult planet as Mars. The planet stood out clearly and steadily, revealing the wonderful markings with striking distinctness, and presenting such a mass of detail as to be beyond the

capacity of man to represent perfectly.

The peculiar haze has been observed previously by numerous observers, notably Pickering, and Mr. Stanley Williams, A. R. A. S. The latter during his observations in 1894 recorded that the clouds over Mare Cimmerium and Mare Sirenum were so dense as to make a large part of these seas apparently disappear altogether, rendering the seas as bright as the land. Professor Pickering followed up this peculiarity and published his results in his notable work, "Martian Meteorology," which has contributed more to the widening of our knowledge of this planet than any other publication. This well-known astronomer remarked that the clouds of Mars are always of a light yellow tint but could advance no reason for such a peculiarity.

When therefore the Meudon refractor was brought to bear upon the planet at the first favorable opportunity, the spectacle presented created deep astonishment. The interest in the phenomenon was accentuated by other observers being unable to recognize familiar markings on the planet for the self-same reason. So completely were they enveloped by this mysterious veil that many could not bring themselves to believe that they were gazing upon spots which were familiar to them.

The veil was observed in August and then was very dense and assumed a pale lemon tinge. When seen later at Meudon it was not quite so dense, but was appreciably darker, being of a golden yellow color. Moreover the fact was plainly conspicuous that these clouds were moving very quickly over the Martian surface for points which one day presented their normal ruddy tinge two days later appeared quite golden. But the most remarkable instance of this obliteration of famous landmarks on the planet occurred in regard to the sheet of water, *Phoenicis Lacus*. When the observers concentrated their attention upon Mars on October 6th, this lake was perfectly black, as if a bottle of ink had been upset, and was surrounded on all sides by the yellowish mist. It assumed the form of a heart and was so startlingly conspicuous that it interfered with investigations of other parts of the planet for the eye was continually drawn to and unconsciously riveted upon this spot. Yet five days later the black spot had disappeared! In its place was a faint greyish shading.

Is this mist a vapor? Or is it dust such as is expelled from volcanoes when in violent eruption on our planet? Is Mars undergoing a process of disintegration? Have forces, the potency of which is incalculable and inconceivable been loosened and are breaking up this other world? To dip into this question one must first grasp some idea of the characteristics of Mars and its atmosphere. It is generally conceded that the poles of Mars in like manner to those of this mundane sphere are regions of snow and ice; that these in due season

MARS IN A DIFFERENT PHASE
Another excellent drawing made at the Meudon Observatory

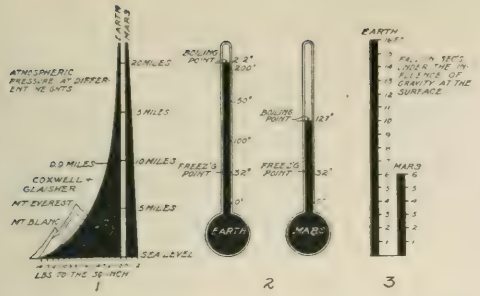
through exposure to the sun melt; and that the water goes somewhere. A great proportion fills the expansive seas, but evaporation is very active. The atmosphere on Mars is much rarer than ours. On the surface of our world the atmospheric pressure is approximately fourteen pounds per square inch, but in Mars it is only about two pounds. To secure a Martian atmosphere on this globe one would have to ascend about ten miles; then one would meet the same pressure that prevails on our planetary neighbor. It is accepted that our atmosphere extends for a height of about fifty miles, that is, judging from the point at which meteors entering this atmosphere become incandescent. But on Mars the same pressure is experienced at a height of 108 miles. This fact, it must be pointed out, disposes of one advanced cause for the peculiar markings on Mars—the scoring of the planet's surface by meteorites—since it is very improbable that meteorites ever reach the Martian surface. This lower atmospheric density plays an important part upon the evaporation of water for whereas at sea level on our earth water boils at 212 degrees Fahrenheit, on Mars the boiling point is only 127 degrees. Gravity at the surface of Mars is less, and this points to the fact that the Martian atmosphere is very languid. Then again the differences between day and night temperature are extremely wide. In the Martian tropics the thermometer stands at noon, almost at the Martian boiling point, so that the people stew almost in a boiler. At night the cold is so intense that practically all masses of water are frozen to the bottom. While one half of the planet—that turned to the sun—is broiling and steaming, the other half—that plunged into darkness—is experiencing a cold greater than ever felt on the civilized portions of this sphere. Truly the inhabitants if there be any, have a most unenviable existence as compared with ours. It is these extremes of temperature which produce the Martian morning and evening breezes. Under the intense heat, however, evaporation is extremely rapid, and the vapor floats in the Martian atmosphere in the form of a thin mist—dense heavy clouds such as we experience are physically impossible.

(1) (2)

THE REMARKABLE PHENOMENA OBSERVED ON THE MARTIAN SHEET OF WATER, PHOENICIS LACUS.
On Oct. 6th the lake was observed as the black heart-shaped mass, which five days later assumed the form shown in (2).

MORE CLOSELY DEFINED MARKINGS OF MARS.
Another drawing from the Meudon Observatory.

Under these circumstances the mysterious veil might possibly be attributed to vapor, but in connection with the observations another interesting phenomenon was noticed. Curious disturbances were seen about the polar cap. One



(1) Comparison of Atmospheric Pressure at Different Levels on Earth and Mars. 15 Pounds per Square Inch on Earth and 2 Pounds on Mars. (2) Water Boils at 212 Degrees on Earth and at 127 Degrees on Mars. (3) Gravity is Very Slight on Mars. An Object Falls on the Surface of Mars 6 Feet per Second and on the Earth 16 Feet per Second.

observer found a huge crevasse, as if the cap had been fractured. On the one side of the yawning chasm was a large patch, while on the opposite bank there was a brilliant space. A bright spot was also observed to have detached itself apparently from the ice cap and had partly covered one of the dark areas on the planet partially concealing it from view. M. Antoniadi confirmed this development to a certain degree, for he observed a protuberance on the Polar snow which became detached or separated from the prevailing snow area by a dark line. This was probably the same phenomenon recorded by the other observers.

Whether the network of markings which Professor Lowell maintains are canals, will ever be scientifically accepted as such, no one can say. At the moment the weight of scientific opinion is against the Flagstaff astronomer in no uncertain manner. The designation of these dark streaks connecting the dark areas accepted as seas in contrast to the ruddy expanses accepted as land, as canals—due to the corruption of the Italian "canalli" by Schiaparelli, was unfortunate, for it has precipitated the greatest scientific discussion that has ever waged. Schiaparelli dubbed them "canalli" for lack of a better word, but it is obvious that such a description is extremely elastic, inasmuch as the narrow lengths of shading have appeared in widely different forms. If these markings are really geometrically built canals they should be fixed, and as we have already shown that the clouds of Mars must inevitably assume the form of thin mists, the lines should have shown plainly here and there through the breaks in the enveloping yellow veil. But they did not do so, and consequently their existence is disputed and considered as a pure optical illusion, unless the planet being in the throes of a cataclysm, the Martians' efforts were in vain and the whole system has been wiped out.

Many scientists are inclined to the belief that disaster swift and sudden has swept over the planet. There must have been a severe tremble through the solar system when Mother Earth discarded our moon from her body. The changes in the surface of Mars may have led to an upheaval which has resulted in eternal silence and desolation.

A Less Distinct Result Due to Vibrations in the Atmosphere.

WHERE NATURE HAS DUG A MILLION-DOLLAR TUNNEL

By

CHARLES A. WHITTLE

TWELVE miles west of Gate City Virginia, the Virginia and Southwestern Railway has put to practical purposes one of the natural wonders of the world. A tunnel nine hundred feet long with a "cut" for an approach several hundred yards in length, all wide enough for three trains to run abreast, has been prepared during long gone ages for the use of the Virginia and Southwestern Railway.

Stock creek in time long past confronted a rib of Clinch mountain with nothing else to be done but drive a tunnel. Long ago the creek completed the job but—a job which would make digging the Panama canal look like removing a grain of sand as compared to the removal of the mountain.

THE NATURAL RAILWAY TUNNEL.

If it had been straight cutting through the mountain, it would not have been so formidable but when the whole mountain kept "caving in" and tumbling down in spite and resentment of the persistent borer working at its base, it piled up a task that would have financially wrecked all the contracting firms of this country if they had by plans and specifications, to use only the tools that have been employed by the stream.

The stream worried along with its task, ages long, and bit by bit bore away the ever-appearing obstruction. Geologists might figure a million years and fall short of the time that the stream devoted day and night to clearing the "cave in," and opening up the tunnel for regular business. At any rate the stream has conquered the mountain.

Where the mountain tried hardest to stop the borer, where it hurled hundreds of thousands of tons down into the breach, there is now a great circular elevator shaft, but the elevator is "not running."

In other terms it has been designated an amphitheater. Apt enough too. Never a Roman gathering equaled the uproar of those rock walls when the passing train starts the alarms and the mountain's weird and demoniac protest against the invasion of its privacy.

In its task of carrying away the mountain by particles, the creek left a clean cut approach, its sheer cliffs of limestone breaking the sky-line above with pinnacles and battlements fringed around with a roof garden of nature's making. Nature also has applied the brush and has ornamented the bare walls with tints of red, gray, and brown, colors mixed in nature's laboratory, the ingredients being lime, iron, and magnesia.

In the Appalachian country, railroads must follow the water's flow, and it is the Virginia and Southwestern's distinction that it is the only railroad which has followed a water course under ground. It found a substantial bed of rocks for tracks, it found that nature had already furnished perfect masonry for wall and arch, and even that many high arches and devious branches have been fantastically wrought in the base of the mountain.

But the one straight course of road and stream are held and the nether courses, vaults, and domes that reach to each side are left to the echoes and the bats.

The stream and the railroad hold the pass and should another railroad desire the use of this gateway to the rich coal fields of southwestern Virginia it will be "by your leave." The Virginia and Southwestern Railway got there first, pre-empted nature's gateway to nature's resources beyond—and all others must pay toll.

Rest not! Life is sweeping by,
Go and dare, before you die;
Something mighty and sublime
Leave behind to conquer time!
Glorious 't is to live for aye,
When these forms have passed away.

Haste not! rest not! calmly wait;
Meekly bear the storms of fate!
Duty be thy polar guide;—
Do the right whate'er betide!
Haste not! rest not! conflicts past,
God shall crown thy work at last.

—GOETHE.

"ROBINSON CRUSOE'S ISLE."
Where the convicts of the penal settlement are housed.

ROBINSON CRUSOE'S ISLAND A CONVICT SETTLEMENT

By

H. J. SHEPSTONE

JUAN Fernandez is a small island in the Pacific, some 450 miles from Valparaiso. When the latter was destroyed by earthquake a few years ago it was reported that the island had disappeared. When things had quieted down the Government sent a destroyer to ascertain if the rumor was true. It appears that the shock had been felt at Juan Fernandez, but the island still remains. It was Defoe, of course, who rendered the island famous by his romance, "Robinson Crusoe." He is said to have written the book after hearing the adventures of one Alexander Selkirk, who lived alone on the island for four years and four months.

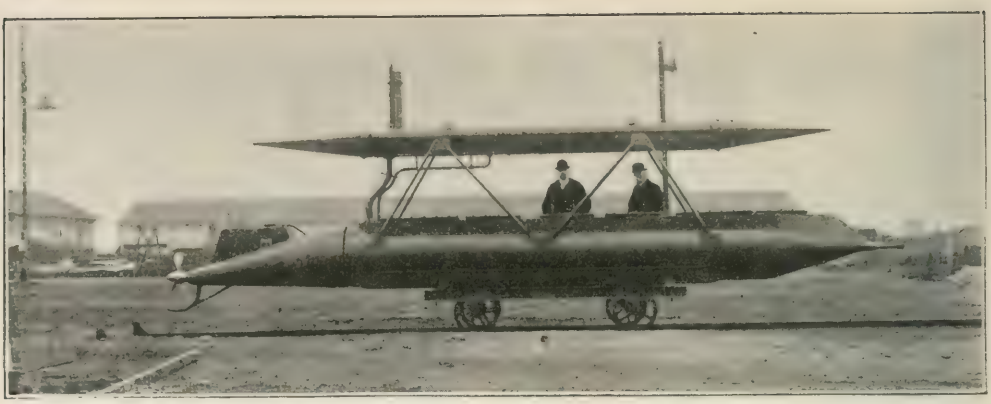
It was in 1704 that Selkirk was landed on the island at his own request, because he had a grievance against his captain. He was left by his companions with a fair stock of clothes and boots, a tolerable amount of ammunition, a musket, a kettle, some pounds of tobacco, a Bible and other books and a few mathematical instruments. He had vegetables, too—turnips, parsnips, cabbages, watercress, and parsley. Yet it took Selkirk eight months to reconcile himself in any degree to his lot, and when he finally settled down he did not find life in his island kingdom so easy or so enjoyable as some writers have led us to suppose.

The pimento tree, which flourishes on

the island, supplied him not only with pepper, but with candles and sweet-smelling firewood as well. He reared a large number of kids to insure plenty of food in case illness interfered with his hunting—and, indeed, he was once laid up for a fortnight by tumbling over a precipice while pursuing a goat. He beguiled his idle moments by teaching his kids and cats any number of tricks. Clothes he provided out of goatskins; but could not manage to make new shoes, so he had to go barefooted when his old ones were worn out. During his long abode on the island he saw many ships pass, but of these only two put in to the shore. From these some Spaniards landed, who, perceiving Selkirk, gave chase. By this time, however, he had learned to run down a goat, so had no difficulty in keeping his visitors at bay. This was the only occasion on which the outer world invaded his solitude until the arrival of the ship in which he left Juan Fernandez forever.

Juan Fernandez had other castaways besides Selkirk. Some lived on the island a few weeks and others several months. Originally the island belonged to Spain, from which it was taken by the Chilians. Since 1835 they have leased the island several times. In 1863 it was purchased by Robert Wehrdan, a German engineer, who established a small but thriving colony there. In the same year H. M. S. *Topaze* visited the island and erected a tablet to the memory of Alexander Selkirk. In 1877 the island was again let to an eccentric Swiss, who wished to taste the delights of seclusion. He took with him a small band of colonists, who from their manner of life might have been styled the Swiss Family Robinson, but they soon tired of the experience and came away. Last August the Chilian Government sent a surveying party, which included the President of the Republic, to see whether Juan Fernandez was suitable for a modern convict settlement. The report was favorable, and the first batch of prisoners have now taken up their residence on the island. While the convicts will not have to undergo the hardships that made Selkirk's life one of privation, they will be exiles no less than he.

THE CAVE IN WHICH SELKIRK LIVED
For over four years the shipwrecked man made this grotto his home.



THE TORPEDO THAT CAN BE GUIDED BY WIRELESS.

STEERING BY WIRELESS

By

DR. ALFRED GRADENWITZ

AFTER once overcoming the most elementary drawbacks, wireless telegraphy has in an astoundingly short time assumed an enormous economical importance, and its stations have rapidly spread throughout the surface of our earth. The same waves that are instrumental in transmitting wireless telegrams have lately been used with marked success for conveying the human voice to ever-extending distances.

It will therefore be readily understood that inventors should be intent upon designing even other ways of utilizing those mysterious waves which, hidden though they be to human eyes, are able, in a fraction of a second, to bridge any boundaries of space. Wireless power transmission has thus been frequently attempted and has actually been achieved on an experimental scale. A French inventor, Mr. Gabet, has now aroused a sensation by his experiments on the steering of torpedoes by means of electro-magnetic waves.

THE WIRELESS RECEIVER BY WHICH THE BOAT IS STEERED FROM THE SHORE.

These experiments, made at Chalons-sur-Saone, are illustrated in the accom-

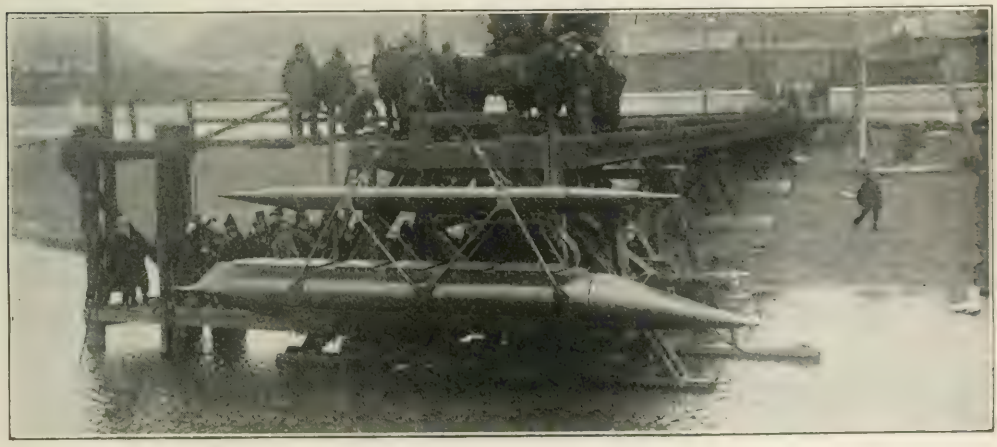
panying pictures. As a torpedo controlled from the shore is destined to prove a fearful weapon, capable of bringing destruction to the enemy's armoured vessels, while the operator may enjoy perfect safety on the shore, a short description of those trials will doubtless be found interesting.

One of these illustrations represents the torpedo which had been manufactured at the Creusot shipyards, on a truck destined to convey it to the shore; another shows the moment the torpedo is launched into the water. The projectile, the propeller and rudder of which are distinctly visible, is provided with a remarkable superstructure. It is well known that torpedoes are rather difficult to launch with absolute safety as their speed is so very small for a projectile, while the object of aim is usually in motion. The Gabet torpedo is intended to eliminate both drawbacks, by automatically moving under the action of a motor plant, while being steered easily and safely from the shore—or from shipboard—by means of electric waves. The wireless signals given out from the sending apparatus produce in a receiver on the torpedo mechanical effects used in controlling both the speed and direction of the projectile. As the two factors determining the course of the latter, can thus be controlled at will, the torpedo is conveyed with unfailing safety towards its aim.

A third photograph represents the

THE LIGHTHOUSE AT NUREMBERG.

torpedo immersed in the water, only the float being visible on the surface. Owing to its remarkable capacity and the efficiency of the engine, the torpedo allows a much larger explosive charge to be carried than in other types of torpedo, so that its destructive effects are verily enormous. In its outside aspect, it resembles a Whitehead torpedo of very large dimensions, measuring thirty feet over all and weighing four tons. A distinctive feature from ordinary types of torpedo is the float surmounting the projectile in which are carried the apparatus controlling the latter.



LOWERING THE TORPEDO INTO THE WATER.

Like a miniature submarine, this torpedo secretly makes its way towards the enemy, hunting up his ships and exploding them under the action of an invisible, far-distant hand which at its will sends out those wonderful electric waves.

A scheme, designed by Messrs. Wirth and Beck, of Nuremberg, enables the operator to turn steering wheels or crocks of a ship to the right or left by wireless, and to insert or cut out all kinds of electrical apparatus.

The Launch Travelled Under Perfect Control Without a Soul on Board.

The first practical tests of the apparatus were recently made on the Dutzendteich, a small lake in the outskirts of Nuremberg, a motor launch being steered by wireless transmission from the sending apparatus installed at the lighthouse.

These experiments showed the problem of wireless steering to be solved in a splendid manner, any orders being transmitted from the wireless sender to the remote switch, and thence to the rudder of the motor launch, with lightning speed, so that the rattling of the sender and the operation of the electric switch could be perceived simultaneously on approaching with the motor launch the lighthouse where the sending apparatus had been located. Excellent results were obtained in this connection with a special contact retarding device intended to paralyze, in due time, any erroneous manipulation. Several curves and complete circles to the right and left were described readily by the motor launch.

Lighthouse From Which the Torpedoes Were Controlled.

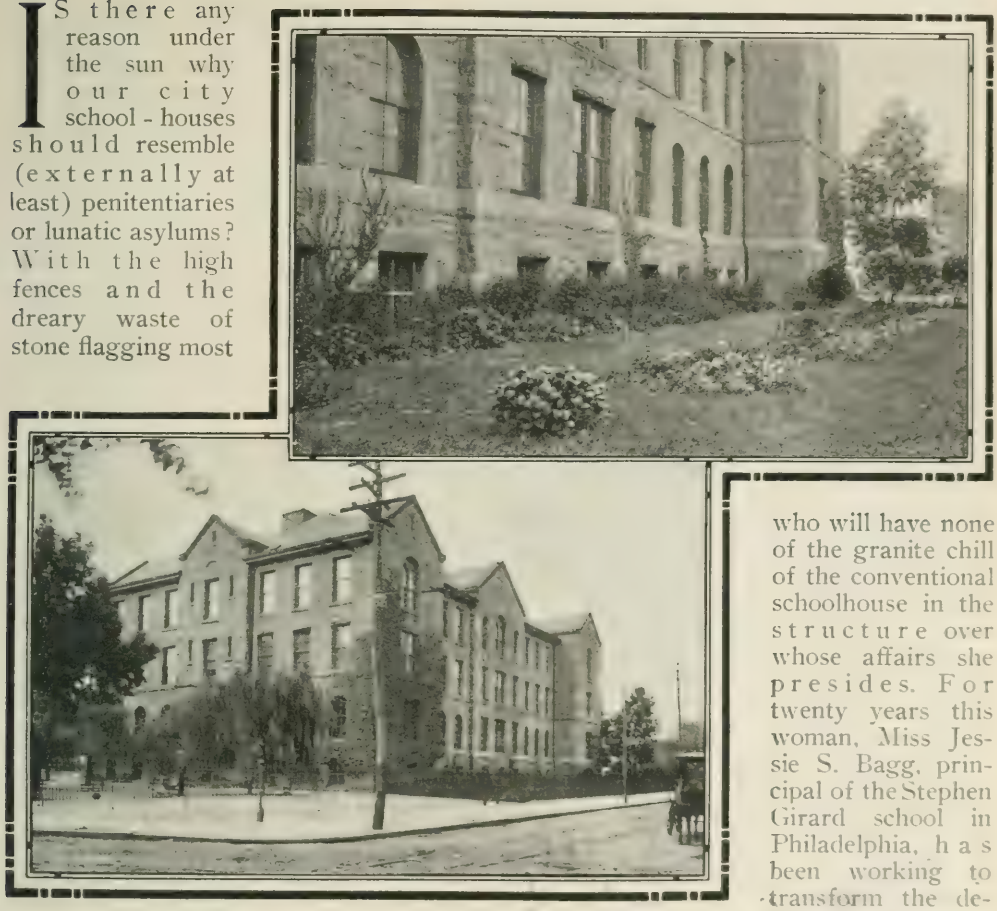
The apparatus differs considerably from that used by Gabet for the steering of torpedoes. Whereas Gabet ensures the contact retarding by means of a curved exhausted glass tube filled with a drop of mercury—which arrangement, in the case of oscillations of the launch, is liable to get out of order—the ship-steering device is provided for the same purpose with a purely electro-mechanical arrangement warranting a perfectly reliable operation of the apparatus.

SCHOOL YARD A CITY'S BEAUTY SPOT

By

H. D. JONES

IS there any reason under the sun why our city school-houses should resemble (externally at least) penitentiaries or lunatic asylums? With the high fences and the dreary waste of stone flagging most of these scholastic structures are about as cheerful in appearance as a gas-house. And this despite the fact that the direction of school affairs in this country is largely in the hands of women, who are popularly supposed to be devoted to the ornate, the beautiful, the æsthetic.



A City School Yard Transformed Into a Miniature Park.

A pioneer woman has been found who will have none of the granite chill of the conventional schoolhouse in the structure over whose affairs she presides. For twenty years this woman, Miss Jessie S. Bagg, principal of the Stephen Girard school in Philadelphia, has been working to transform the depressing environs of her schoolhouse into a structural oasis, and as a result of this continued effort the Stephen Girard establishment has become one of the scholastic show places of the East. The school yard, formerly a stone waste that sent chills chasing down the spine of the visitor and had heaven knows what depressing effect on the minds of the infants who daily

entered its dreary precincts, is now a miniature park where the tired mothers, little and big, of the neighborhood, gather with their charges and sit beneath the grateful shade of the trees.

No board had a hand in this. Miss Bagg probably knew better than to approach the educational solons with a request for money to plant trees in the school yard. She sought no one's aid, but just planted the trees herself, cared for them herself and today she regards them as her own children, for during twenty years of loving care she has seen them grow to their present maturity.

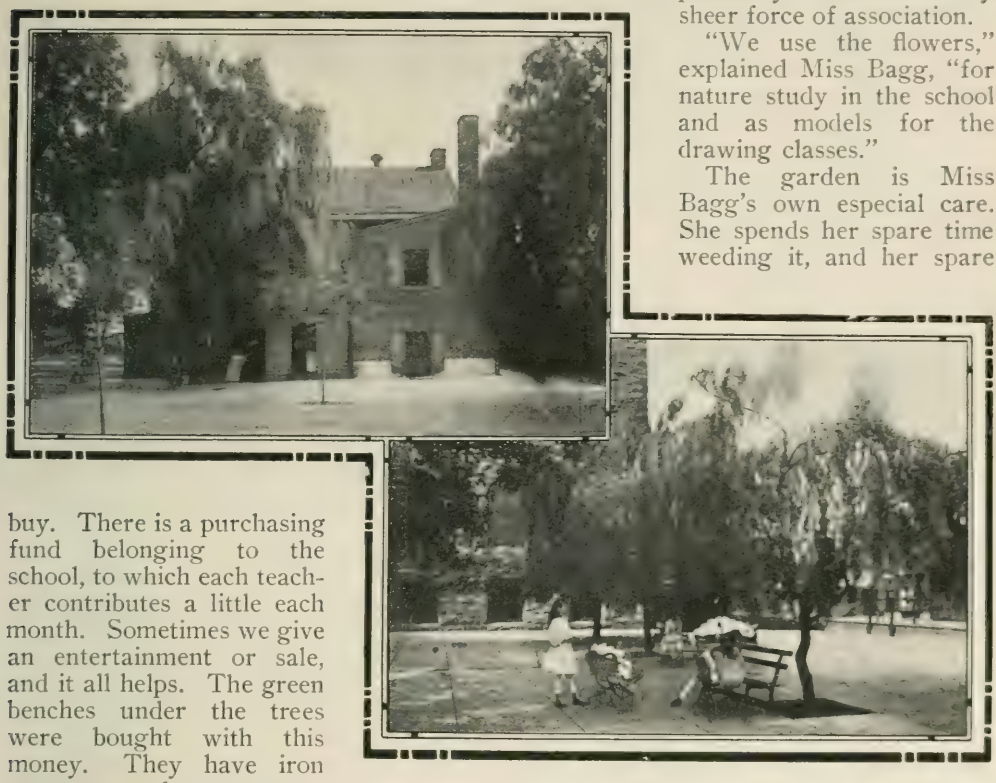
"That was the school building when I first came here," said Miss Bagg, indicating a little brick structure erected by Stephen Girard, which still stands in a corner of the yard and is used as a kindergarten. "I began planting trees then. When the improvements were made in preparation for the new building, I asked the contractors to leave open spaces around the trees when the yard was being paved and to leave unpaved certain other spaces where new trees could be set out. Some trees had to be sacrificed through the erection of the new building because they stood directly upon the site. I hated to see those trees cut down. But I saved the big poplars, near the buildings, because I stayed home all that summer on purpose to protect them from the workmen, who doubtless would have hacked them down if I had not guarded them as I did."

"I am especially fond of these poplars, for they are the trees I first planted. There is a horse chestnut and here is a silver poplar, this is a buttonwood and that a linden. Here is an elm, an ash, a locust. That one was planted lately and is called a ginko tree, but the children call it the fern tree, because its leaves look like the maidenhair fern."

"I want the children to know and love the trees, so I plant as great a variety as possible. I gathered together some of my boys and led an enthusiastic expedition down to the district

THE ORIGINAL SCHOOL BUILDING, ITS UGLY LINES HIDDEN BY IVY.

called the 'Neck,' where willows grow in abundance. We just made some cuttings from the branches and planted them here in the yard. All the trees we could plant from slips we could get for nothing, but some we have had to buy. There is a purchasing fund belonging to the school, to which each teacher contributes a little each month. Sometimes we give an entertainment or sale, and it all helps. The green benches under the trees were bought with this money. They have iron supports and are strong and that made them cost more. I wanted the tired mothers to come to this yard and bring their babies and just have a cool, quiet place to rest during all the hot summer."



WHERE THE TIRED MOTHERS, LITTLE AND BIG, GATHER WITH THEIR CHARGES BENEATH THE GRATEFUL SHADE OF THE TREES.

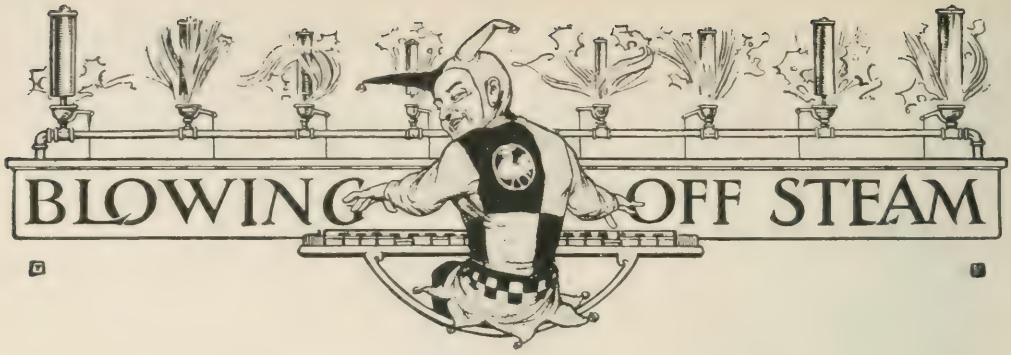
There is daily evidence that the mothers of the neighborhood appreciate the boon of the quiet, shady resting place. The benches are always occupied, and the drooping branches of the pretty willows bend to welcome a host of the "Little Mothers" who daily come with their infant charges.

On one side of the schoolhouse is to be seen the most remarkable transformation of all. Here a garden has been laid out, a green lawn of velvety smoothness replacing the stony courtyard of the conventional schoolhouse. Flower beds are arranged down the center and these glow with masses of iris, phlox, petunias, verbenas, and other old-fashioned flowers, forming a mass of color that makes the plain granite wall of the school house look positively attractive by sheer force of association.

"We use the flowers," explained Miss Bagg, "for nature study in the school and as models for the drawing classes."

The garden is Miss Bagg's own especial care. She spends her spare time weeding it, and her spare money seeding it. She pays from her slender resources for the paint which brightens the benches on which sit the tired mothers. The Board of Education may know of the existence of the school garden and of the trees that have grown up under twenty years of patient care and attention. But, as before observed, Miss Bagg has asked no favors from any one. She has made her oasis in a scholastic desert herself and she has her reward in the possession of the prettiest and most attractive school building in the east.

What the beautiful shady school-yard with homelike buildings will mean in the future lives of the pupils can only be imagined.



The Lord Smileth

MR. JONES had recently become the father of twins. The minister stopped him on the street to congratulate him.

"Well, Jones," he said, "I hear that the Lord has smiled on you."

"Smiled on me!" repeated Jones. "He laughed out loud at me!"—*Everybody's.*

Discrimination

"POLITICS," said the ambitious young man, "puts many temptations in a person's way."

"Yes," answered Senator Sorghum; "and the worst of it is that it is often difficult to discriminate between a temptation and an opportunity."—*Washington Star.*

On the Safe Side

MRS. NEWWED—"Bridget, I saw you kiss that man you entertained in the kitchen last night."

BRIDGET—"Shure, mum, an' yez wouldn't have me resist an officer, would yez, mum?"—*Exchange.*

New Dialect

GEORGE ADE, with a fellow American, was traveling in the Orient, and his companion one day fell into a heated argument with an old Arab. Ade's friend complained to him afterward that although he had spent years in studying Arabic in preparation for this trip he could not understand a word that the native said.

"Never mind," replied Ade consoling. "You see, the old duffer hasn't a tooth in his head, and he was only talking gum-Arabic."—*Cosmopolitan.*

P. S.

LITTLE JOHNNY—"Dad, there's a girl at our school whom we call 'Postscript.'"

DAD—"'Postscript!' Whatever do you call her 'Postscript' for?"

LITTLE JOHNNY—"Cos her name is Adeline Moore!"—*Tit-Bits.*

Different Viewpoint

"WELL," sighs the man with the wash tie, "now that the aeroplane is becoming popular the women won't spend so much money for automobile hats and veils."

"No," growls the man with the ingrowing mustache, "but they'll blow in just as much on silk stockings and high heeled shoes."—*Judge.*

Of Course!

"UNCLE JOHN," said little Emily, "do you know that a baby that was fed on elephant's milk gained twenty pounds in a week?"

"Nonsense! Impossible!" exclaimed Uncle John. "Whose baby was it?"

"It was the elephant's baby," replied little Emily.

Try Again

Two young ladies boarded a crowded tramcar and were obliged to stand. One of them, to steady herself, took hold of what she supposed was her friend's hand. They had stood thus for some time, when, on looking down, she discovered that she was holding a man's hand. Greatly embarrassed, she exclaimed:

"Oh, I've got the wrong hand!"

Whereupon the man, with a smile, stretched forth his other hand, saying:

"Here is the other one, Miss."—*Tit-Bits.*

Something the Matter with George

"I DON'T know what to make of my nephew George," remarked the elderly professor. "He has such queer, contradictory tastes in music."

"Yes?"

"Yes; I came upon him a little while ago and he was whistling in a dreamy, rapt sort of way the wedding march from 'Lohengrin.' As soon as he saw me he looked confused and changed it at once to 'Has Anybody Here Seen Kelly?'"—*Chicago Tribune.*

Mean

"MAUDE was at the cat show," remarked Gladys.

"As an exhibit?" sweetly inquired Grayce.—*Scissors.*

Slight Misunderstanding

A YOUNG man took his seat in a restaurant. A waitress approached his table with a shuffling gait.

"Have you frog's legs?" he inquired.

"No, indeed! I have the rheumatiz."

Ungallant

TEACHER—"Which letter is the next one to the letter 'h'?"

BOY—"Dunno, ma'am."

TEACHER—"What have I on both sides of my nose?"

BOY—"Freckles, ma'am."—*The Wasp.*

The Evidence Located

"DID you sweep your room, Bridget?"

"Faith an' I did, mum. If yez don't believe me, look under the bed."—*Life.*

Often the Case

"WHY don't you tell your views?"

"I'm afraid to," answered Senator Sorghum. "Whenever I tell my views on any subject I run the risk of stirring up an unanswerable argument on the other side."—*Washington Star.*

Traffic Rates

FIRST CABMAN—"What did you charge that stranger for driving him around the corner to the hotel?"

SECOND CABMAN—"Four dollars and ninety-seven cents."

FIRST CABMAN—"Why didn't you make it an even five dollars?"

SECOND CABMAN—"Because four dollars and ninety-seven cents was all he had."—*Lippincott's.*

Conforming to Proprieties

A LITTLE girl aged three had been left in the nursery by herself, and her brother arrived to find the door closed.

"I wants to tum in, Cissie," said Tom.

"But you tan't tum in, Tom."

"But I wants to."

"Well, I's in my nightie-gown, an' nurse says little boys mustn't see little girls in their nightie-gowns."

After an astonished and reflective silence on Tom's side of the door the miniature Eve announced triumphantly: "You tan tum in now, Tom; I tooked it off!"—*Ladies' Home Journal.*

What Was It?

THE little daughter of a clergyman stubbed her toe and said "Darn!"

"I'll give you ten cents," said her father, "if you'll never say that word again."

A few days afterward she came to him and said:

"Papa, I've got a word worth half a dollar."—*Everybody's Magazine.*

Foiled

HE was very bashful and she tried to make it easy for him. They were driving along the seashore and she became silent for a time. "What's the matter?" he asked. "O, I feel blue," she replied. "Nobody loves me and my hands are cold."

"You should not say that," was his word of consolation, "for God loves you, and your mother loves you, and you can sit on your hands."—*Success.*

In Bad

"LET me see," began Mr. Henpeck, "the wooden wedding is the fifth anniversary, isn't——"

"No," snapped his wife, "when one marries a blockhead, the ceremony itself——"

But the miserable man had fled.—*Philadelphia Press.*

TRAIN CROSSING FIVE-MILE BRIDGE OVER ALBEMARLE SOUND.

BRIDGE FIVE MILES LONG

By

LITTELL McCLUNG

WITH the opening of one of the longest bridges in the world another triumph has been scored in the era of straight cuts in railroad building. This new structure is the bridge of the Norfolk & Southern Railway across Albemarle Sound in the eastern part of North Carolina. It opens up a territory that is hardly matched in the East in the wealth of its timber forests and its agricultural possibilities. This territory embraces about 4,000 square miles.

Heretofore all produce collected for shipment on the south side of Albemarle Sound has been transferred across the water by steamers. It took two hours and a half to make the round trip. It was decided that the time had come to bridge the Sound and thus clip an hour off the schedules of passenger trains and from six to twelve hours off the time of freight deliveries.

The engineers in charge of the work were peculiarly fortunate in having in their hands almost nearly all material necessary to construct the bridge. Along the shores of Albemarle Sound the long-leaf pines rear their graceful tops high in the air. So the thick, dark forests of these trees were invaded for the thousands of piles that were to be driven into the bottom of the Sound.

But, owing to the low, swampy nature of the land, the engineers met with other obstacles than those incidental to the building of the bridge. The survey of the roadbed on the south side of the Sound passed through bog lands known as Davenport's Swamp. Here for nearly a mile the foundation of the roadbed was first mattressed with logs and brush and then filled. As was expected, the fill sank, but due to the mattress it sank uniformly and the track was raised. After running construction trains over it for six months the mattress of logs reached a firm foundation and there was no further appreciable settlement of the fill.

The bridge itself is 26,668 feet long out to out of stringers—more than five miles. For 19,000 feet the average depth of the water through which it runs is twenty-one feet, shoaling at each end to an average depth of four feet.

POPULAR · SCIENCE & MECHANICS SUPPLEMENT ·

LLAMAS IN HARNESS

AN interesting attraction in one of the European Zoölogical Gardens is a pair of tame llamas that carry passengers about the grounds. They are declared to be the only creatures of their kind in Europe that have been trained for this purpose. The animals draw a light carriage and at a recent test it was shown that they could easily pull a load of 450 pounds. They are quite docile and readily answer to the rein.

AERONAUTIC TROPHY

ONE of the first trophies ever offered in the United States for a flight by a heavier-than-air machine across water is depicted in the accompanying photograph. This is the Page trophy which is offered for the first flight across Long Island Sound.

The figure and supporting pedestal are done in half-life size, the whole being little over six feet tall and being made from sterling silver. The work was

LLAMAS DRIVEN TO HARNESS.

STERLING SILVER AERONAUTIC TROPHY, SIX FEET TALL
Page trophy, offered for first flight for heavier-than-air machines across Long Island Sound.

done in a single piece cast and the whole burnished to a satin finish. The little aeroplane supported by the figure is modeled after the Curtiss machine and all of the bolts and stays are brought out in surprising relief. The trophy weighs several hundred pounds and is said to be worth $3,000. The trophy has been on exhibition and will probably be competed for during the coming season.

AERIAL MAIL ROUTE

THE United States mail takes many strange rides. Perhaps the nearest approach to a journey in an airship is the trip it makes in an aerial basket over the Missouri River at Baker's Ferry in northwestern North Dakota. The railroad is far distant from the lone homesteaders west of the Missouri. Mail and passengers must need come by stage to the east bank of the river, and there make a crossing.

Ordinarily a cable ferry bears them over, but in the spring and fall there are often times when the ferry dares not brave the treacherous river. At such times the mail and the boldest of the passengers make the crossing in a basket suspended from a cable forty feet above the channel. As the passengers move the basket along by pulling at the cable, the crude car sways perilously, and they find the aerial ride sufficiently exciting to satisfy the most exacting seeker of thrilling or nerve racking experiences. It is illustrated on the opposite page.

BRINGING REINDEER FROM SIBERIA

ACCORDING to latest accounts, there are now something like 27,000 reindeer in Alaska—all of them the progeny of 600 or so which were imported from Siberia less than a dozen years ago.

Our government undertook the job for the benefit of the Alaskan Eskimo—the idea being that, if they could be induced to breed and herd reindeer, they would always have food and clothing. The destruction of the walrus, which was formerly their chief dependence, has threatened them seriously with starvation.

So far the experiment seems to have been decidedly successful, though the Eskimo are still dying much faster than they are born. Contact with civilization does not agree with them.

Over on the Siberian side of Bering Sea are tribes of Chukchis, nomad barbarians, who keep large herds of reindeer—thus obtaining a subsistence—and drive them down to the seashore in the summer time. From them the government obtained the animals it wanted, which were paid for at the rate of about five dollars a piece, hoisted aboard the revenue cutter Bear, and safely delivered in Alaska. Expert "deer men" were imported from Lapland to teach the Eskimo how to take care of the useful beasts.

CABLE FERRY FOR UNITED STATES MAILS.
Often the only means of crossing the Missouri river at Baker's Ferry, North Dakota.

"STORM TELLER" ON LONDON'S TUBES

TRAFFIC controller in his office at Leicester Square Station, London, with the various clocks and electric devices with which he is enabled to keep in touch with everything that is happening on the tubes underground railways is shown in one of the illustrations. On the left-hand upper corner of the picture is the "Headway Clock," which is brought to zero after each train has passed and then ticks off the minutes, each figure representing a minute, so that the driver of the train following can see how many minutes are dividing him from the train in front. This clock in the controller's office is a duplicate of

HOISTING REINDEER ABOARD [illegible]
SIBERIAN COAST.
Bringing reindeer from Siberia to Alaska for the use of the Eskimos.

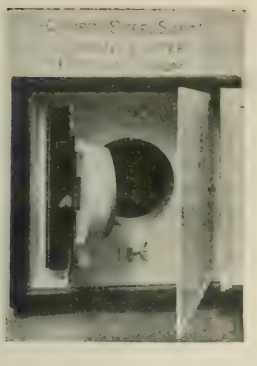
those dotted about on the railway line at various points. On the right-hand top corner is one of the system of clocks which are wound automatically and synchronized with a master clock every hour. Between the two is the barometer by which a check on the weather is kept, and when rain is denoted the controller keeps an anxious watch for approaching storms. If in his judgment the rain is likely to last he can, through the telephone switch board, communicate with the yard masters and set the "Storm Service" in operation. This means that an additional ten trains an hour are run on each line and relief carriages are added to the trains in the ordinary service. This novel and enterprising departure in railway running is to provide for the extra rush of passengers who flock to the tubes whenever there is a storm and overcrowd the ordinary accommodation. The dial at the right beneath the electric clock is a "Train Recording Clock," the dial being of paper, and on this each train automatically registers its arrival by marking a dotted line on the outer edge of the dial, which is revolved by clockwork, so that the space of time intervening between the various trains can be plainly seen and a permanent record of the service kept. These sheets are sent to the Superintendent each day.

Traffic Controller at Leicester Square Station, London, Looking Out for Storms.

The Storm Service Controller at Leicester Square Station, London, on the Underground Tubes.

THE FIRST RADIUM SAFE

DESIGNED by the technical advisers to the British Radium Corporation, a most ingenious safe, the first of its kind, has been constructed in London, by Messrs. Chubb and Sons, to protect radium from burglars. The safe is about 3 feet in height and weighs nearly 1½ tons. Not only was it necessary to protect the radium against burglars but also against itself. As radium emanations can pass through the thickest steel the safe had to be made with a steel outer case enclosing an inside leaden shell, the only metal, apparently, which radium cannot penetrate. The inner casing is composed of pure lead three inches thick, and the door is so contrived as to prevent any escape of the emanations through any joint. The door is lathe-turned and of circular formation and is so secured that no ray can possibly get out. By means of a special contrivance any slight looseness caused by the wear and tear of opening and closing



RADIUM SAFE.

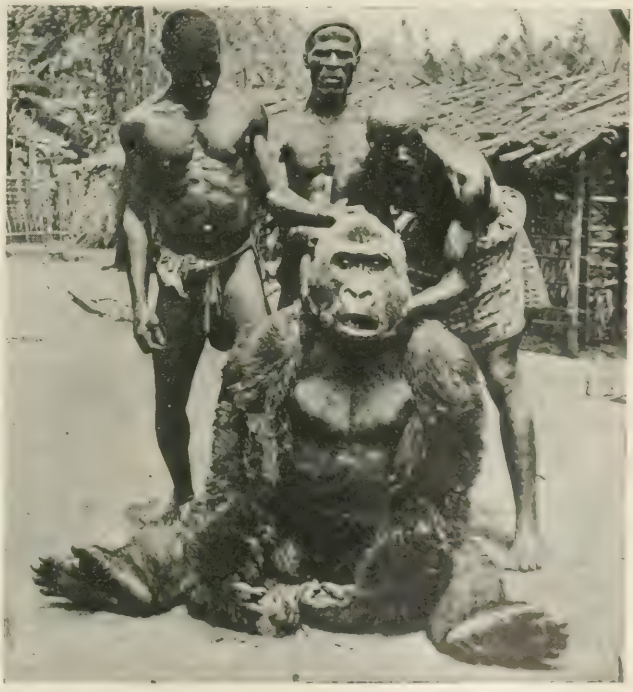
the door can easily be adjusted. Yet another feature of the safe is an appliance for preventing the loss when the door is opened of any emanations accumulated in the inner casing. Two valves have been inserted into the door and before it is opened tubes with mercury are passed through and these collect and store the emanations. The safe has been made for the British Radium Corporation which is interested in the radium mines of Cornwall, whence radium in solution is now being obtained daily. It is hoped to provide 1,000 milligrams a month.

LARGEST GORILLA EVER SHOT

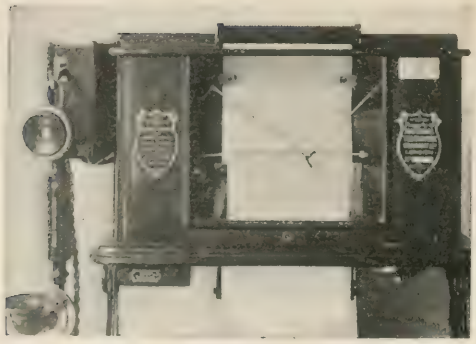
WHAT is claimed to be the largest gorilla ever shot is that shown in the accompanying photograph. It was killed in Kamerum, a German possession in equitorial West Africa. The animal was discovered in a tree and a well-directed shot by the traveler brought it to the ground. It stood 5 feet 5 inches in height, and measured over 8 feet from finger to finger. It weighed about 500 pounds and was in perfect condition.

WRITING BY TELEPHONE

THE Lord Mayor of London opened a "telewriter" exchange on July 1st. The "telewriter" will transmit in writing everything that is capable of being written. Thus, if you want to leave a friend a message assuming he is out when you telephone at his office or house, in your own handwriting, you can do so by means of the "telewriter" without going out of your room. The "telewriter" is attached to the ordinary telephone wire without any interference with the telephone service, and there is no complicated switchboard. You merely press a button and write, and your message in your own handwriting is reproduced on a similar roll of paper at the office or residence of the person with whom you wish to communicate. The instrument faithfully reproduces signs in any variety of combination, and deals just as easily with a drawing or sketch. Every detail reappears at the other end of the line. Messages have passed between Manchester and London and Birmingham and London in this way. The telephone and the "telewriter" do not clash in their use. The connection is automatic. The mere action of lifting the receiver to speak puts you in connection with the telephone or of lifting the pencil to write with the "telewriter." Simplicity is the keynote of the mechanism. The arms of a pantograph connected with the transmitting pencil regulate the electrical currents which are



THE GORILLA JUST AFTER IT WAS SHOT.



MESSAGE COMING THROUGH "TELEWRITER."

sent over the connecting wires, and which cause the receiver pen to move just as the transmitting pencil moves. "We have, of course, already a good many subscribers in London," said a representative of the manufacturers, "and we shall have an exchange in each of the larger cities as rapidly as enough subscribers to warrant it are secured. We shall certainly open one when we have arranged contracts with fifty users in any locality."

NEW SOURCE OF PAPER

THE discovery that a good grade of paper can be manufactured from yellow pine may lead to the establishment of a number of paper mills in the sections of the country where that timber grows abundantly. The only yellow pine paper mill in the United States is situated at Orange, Texas. It was erected a few years ago and the product which it turned out met with such favor among the paper trade that the mill has just been enlarged, its capacity now being 33 tons of paper daily. It is situated in the midst of yellow pine forests. The refuse of the lumber mills is easily available for the manufacture of the paper pulp from which the finished product is made. The experiments in the manufacture of paper from yellow pine covered a period of several years before a process was finally discovered that insured the success of the new industry.

CITY BUILT OF MINING WASTE

THE Joplin district produces yearly over 300,000 tons of zinc and lead ores. These ores occur intimately associated with lime and flint and are separated from these materials by a washing process. In order that the separation may be economical it is necessary to crush the ore from the mine to about one-fourth inch size. As a result of these operations many hundreds of tailings piles are scattered over Jasper County and millions of tons of "chats," as they are locally called, are produced every year.

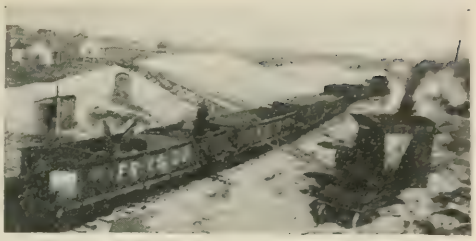
There has been a gradual awakening to the value of these chats among the people of the district. At first they were used for making roads. Then the railroads took them up and the roads radiat-

YELLOW PINE PAPER MILL AT ORANGE, TEXAS.

TRANSMITTING A MESSAGE ON THE "TELEWRITER."

ing from Joplin have many miles of track ballasted with this material. With the advent of cement construction chats were used, as they were the most easily available material. The sidewalks of the cities of the zinc district are constructed almost entirely of chat concrete.

Foundations of buildings were the next field entered by chats and nearly every building erected in the last five years has a foundation of chat concrete. But it was not until the present year that chat concrete was seriously considered in building construction. The question was investigated thoroughly by architects and contractors and there is at present



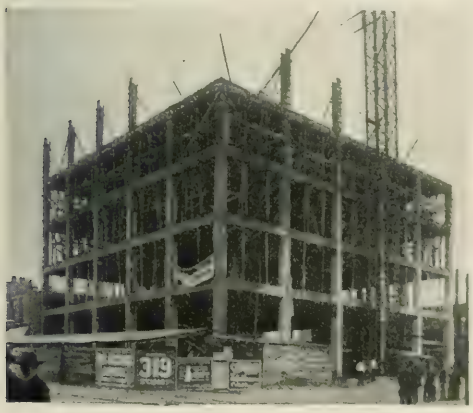
LOADING CHATS WITH A STEAM SHOVEL.

and the other fortunate cities of this district will be built from the mining waste that abounds at their doors. The cost of these chats is generally ten cents a load

HISTORICAL PAGEANT AT DONCASTER, ENGLAND.
Boadicea taunting her soldiers to fight against the Romans. She taunts them with their cowardice.

under construction a six-story modern store building which will be occupied by Joplin's leading merchant.

This departure bids fair to be followed by others and in the near future Joplin



SIX-STORY STORE BUILDING OF REINFORCED CHAT CONCRETE.

and there is no limit to the load, so practically all the contractor pays for is the hauling.

Many thousands of fence posts are made every year from chats, and because of their cheapness and durability are rapidly taking the place of wooden posts. Door sills, window sills, lintels, and steps are made from this material and are finished up so smoothly as to be equal to cut stone in appearance.

MOTOR CAR-BOAT-PLANE

A GERMAN aviator has recently constructed a combination machine which may be used either as an aeroplane, a motor boat, or a motor car as preferred. To convert the aeroplane into an automobile, the planes are unfastened and attached to the body of the machine so as to form the sides of the automobile. A fifty horse-power motor is used.

SPONGE MAKES HANDY MOP

A MUCH easier way to remove the dust from the wainscoting than by going on the hands and knees with a wet cloth is to get a ten cent sponge and attach it to the end of the mop handle in the manner illustrated above. If you dampen the sponge you will find that it is the most handy thing possible to use in going over hardwood floors or getting in the corners where the broom does not penetrate. Also for reaching up into corners where the broom is useless and the hands cannot get without the aid of a step ladder.

Mop Made of a Sponge.

LATEST THRILLER

THE very latest thriller, to take the place of roller coasting, whirling swings, ferris wheels, and other amusement park and summer resort devices that have begun to pall, is the "Airship Spiral." This is the invention of a Los Angeles man, and the first to be erected was successfully put in operation at Long Beach, California, late in June.

The Airship Spiralway.

The "airship" is a strongly built car suspended from the steel framework. A chain pulley arrangement draws it up a steep incline to the top of the circular tower, and then gravity whirls it down the spiral as rapidly as the most ardent seeker after a new sensation could desire. As the car nears the bottom, the speed is retarded until it comes to a full stop on a level track close to the starting point.

Competent engineers have pronounced the device free from danger; but the sensation as the car skates around the curves swinging freely in the air is sufficiently thrilling to insure its popularity among the young people at beach resorts, amusement parks, and other places for which it is adapted.

Granite Hot Spring, Arrowhead, Cal.

EFFECT OF AN EARTHQUAKE

IN May, southern California was shaken by a slight earthquake. This did no damage, and, in fact, was felt by only a small portion of the people of the area affected. However, a curious effect has been noted at the Arrowhead hot springs, near San Bernardino. Prior to the trembler the temperature of the water issuing from the Granite Spring was 196 degrees. Immediately thereafter it rose to 201 degrees, and has remained at that ever since, making this particular spring the hottest hot spring in America. Just why the slight shake should have this effect is somewhat obscure. Some people think the increased temperature of the water issuing from the mountain side may be a premonition of coming earthquakes of greater violence, seeming to indicate greater activity in the earth's internal fires.

As is well known, the Arrowhead Springs take their name from a curious formation on the mountain, resembling an arrow head. This is formed by vegetation, that on the area forming the arrow head being of a different color from that surrounding. Forest fires have

Courtesy of Government Plant Bureau

Bags of Oiled Shavings for Fighting Frost.

burned over the whole side of the mountain on at least two occasions during the past hundred years, and it was thought that the arrow-head had been forever destroyed. However when vegetation began to grow again, it was found to be as distinct as ever.

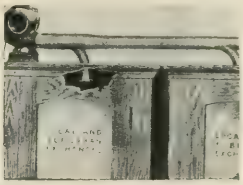
SHIRT MADE OF SCALP-LOCKS.

SHAVINGS FOR FIGHTING FROST

JACK FROST is a dreaded enemy of the fruit-grower. He comes stealthily in the night—especially on clear nights, when the radiation of heat from the earth upward to a cloudless sky so lowers the temperature about the roots of the trees or other plants as to bring disaster.

Many methods are being tried for spreading an artificial cloud over an orchard—experience having shown that such a cloud, acting as a sort of blanket, interferes with radiation and puts Jack Frost at defiance. A smoke cloud serves the purpose admirably.

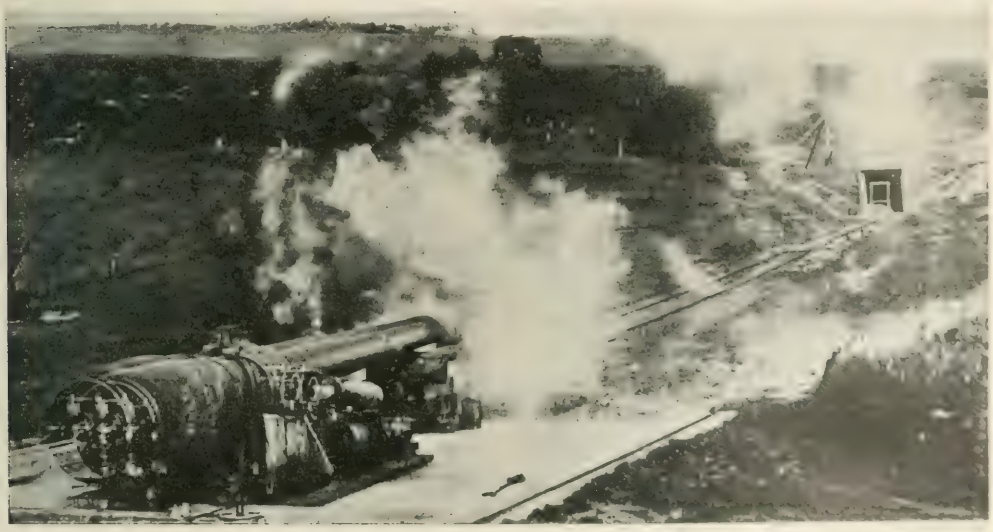
There are various ways of making a smoke cloud, but the newest consists in setting fire to paper bags filled with shavings and soaked with oil. When frost threatens, these—previously prepared in large quantity—are hastily scattered about the orchard, and fired, the result being a dense smoke which spreads throughout the plantation.



FOR VENTILATING TELEPHONE BOOTHS.

HANDY CORKSCREW

A NEW self-pulling corkscrew has a head similar to that of a thumbscrew, and connected to this are two levers projecting downwards. The appliance is placed over the bottle neck, the thumbscrew turned until the screw has deeply entered the cork and the two levers grasped in the hand and nipped together. This process removes the cork.



A TWELVE-INCH GUN BEING FIRED AT THE PROOF GROUND AT RYDSDALE, ENGLAND.
The gun was photographed on same plate before and after firing. It also [illegible]

FAN AND ROCKER COMBINED

THIS is one of the patent models from Uncle Sam's collection at the National Museum in Washington. It represents an ingenious arrangement whereby a person sitting in a rocking chair may, in rocking to and fro, cause a fan to revolve and keep him cool. It does not appear that rocking chairs of this pattern have ever been placed on the market, but they would surely be very desirable in the summer season.

Model of Combination Fan and Rocking Chair.

FENDER FOR AUTOMOBILES

THE increased number of automobile accidents prompted a German inventor to construct a safety appliance, which owing to its simplicity and its reliability of action will prevent people from being run over. The apparatus can be attached to any automobile, and consists of a fender which automatically picks up persons or animals that happen to fall in front of the vehicle. If automobiles are equipped with such a device drivers will possibly be still more careless about running down pedestrians, as the results will not be so serious. But the ordinary chauffeur might not care to meet an irate victim whom he had picked up.

Automobile Fender in Action.

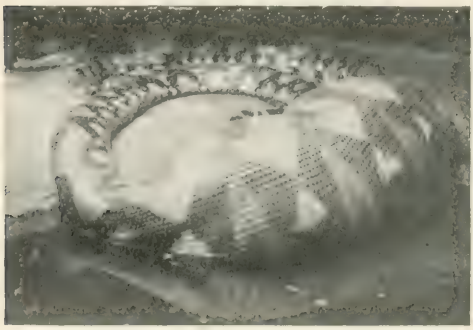
A PYTHON'S MEAL

THE accompanying photograph depicts a python after it had partaken of its meal, consisting of a goat weighing fifty-six pounds. It took the creature about four hours to consume the goat. It had previously taken nothing for three weeks.

PRACTICAL USES FOR GOURDS

ONE must go to Mexico in order to see gourds utilized for practical purposes. In that country big pear-shaped ones are used to hold eggs, and for preserving seeds from mice and moisture. Even scales are commonly made, in rural parts, from the two halves of a gourd and a piece of string. The weights are pebbles. A Mexican who wishes to engage in trade takes a piece of rock to the proper government officer, who chips away fragments of it until it is brought down to exactly a standard pound.

The dishes used by country people in Mexico, as well as many other utensils, grow on trees which are related to our own catalpas. They are called "calabashes," and are put to every imaginable employment, serving, among other things, as market measures. One such



Python Dines on a Full-Grown Goat.

Mexican Dishes Grow on Vines.

ALONZO BADGER AND HIS LIFE-PRESERVING JACKET.

tree furnishes excellent medicine bottles, which are somewhat the shape of whiskey-flasks, each one having a natural cork. It is almost impossible to break these bottles and the Mexicans use them for years.

NEW LIFE PRESERVER

ALONZO BADGER of Santa Monica, California, has just been granted a United States patent for a life-preserving swimming jacket of unique design. In appearance the devise is not unlike a double horse collar. It is constructed of heavy canvas and is slipped on the same as one would don a vest. One arm is placed through each of the collars and the vest is buckled in front. Encased in the canvas is a rubber tube, which is provided with a valve to which may be attached a bicycle or other air pump. Before putting the jacket on, the tube is filled with air and the buoyancy is sufficient to float a body of considerable weight. The vest is so constructed that it is an impossibility for it to slip either up or down or to one side. The vest is designed to be worn by bathers, swimmers or other persons who frequent the deep waters, or for use as life preservers on launches, pleasure boats and steamers.

REAR VIEW OF THE JACKET.

AN AQUATIC CRANE

THIS interesting piece of machinery is to be found at the Navy Yard at Brooklyn. It is primarily intended to lift heavy guns in and out of warships. It took three years to build and cost about $400,000. The projecting arms are 50 feet in length and the crane is designed to lift a weight of 100 tons. It can be floated alongside a battleship and the arm extended over the entire width of the vessel. By this arrangement it is possible to lift a damaged gun of the largest size out of a battleship, and turning, the crane may drop another gun of equal size in its place.

At first cranes were stationary, then they were put on wheels and now they take to the water.

CRANE FOR LIFTING HEAVY GUNS AT BROOKLYN NAVY YARD.

NEW MONORAIL

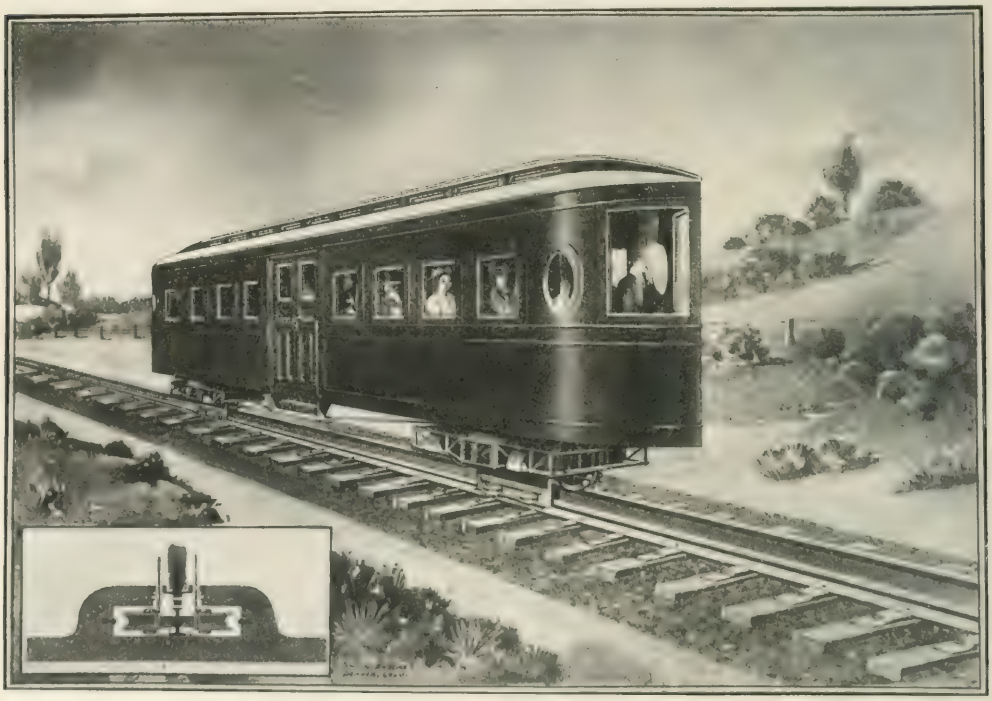
THE accompanying illustrations show a marked departure in the design of the monorail railroad. There are no additional supporting rails, no gyroscopes or other auxiliary contrivances to prevent the car from toppling over. It is simply what its name implies, a monorail on which cars of any standard design may be operated by means of the motive power usually employed for driving traction cars.

The car designed for the monorail is operated by electricity, and is intended for suburban traffic in districts remote from the business centers in our large cities. Residents of the suburbs, the inventor believes, will be enabled by the use of the monorail to reach their places of business in about one-third of the time now required on the ordinary traction or elevated cars, by building the track either above or below the grade crossing through the thickly populated districts. If operated as an elevated railroad, it will not obstruct and darken the streets as do elevated structures in New York or Chicago. It is claimed that it is absolutely safe, that there is no danger of a car jumping the rails and falling to the street below.

FLAMINGO FEEDING ITS YOUNG.

The double track steam railroad has about reached the limit for speed. The Berlin-Zossen high speed trials proved that it was impossible to construct a roadbed that could withstand the shock of a heavy car traveling at high speed, owing to the difficulty of maintaining the two rails of a double track in absolute parallel with each other and at exactly the same level and inclination.

At these trials a specially heavy and well ballasted track was constructed.

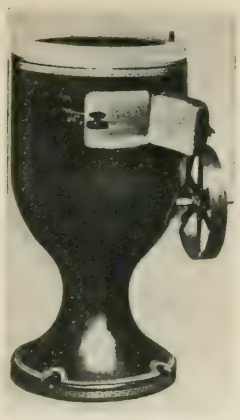


HOW THE NEW MONORAIL CAR WILL LOOK.
At the lower left hand corner is shown the installation of rail at street crossings.

The cars when running over this track at a speed of 120 to 130 miles an hour swayed heavily from side to side, and the heavy pounding soon ruined the roadbed. In the monorail there is no lateral motion, only a vertical fall and rise which would hardly be perceptible on a properly constructed track.

On traction cars operating in city streets, and where grade crossings are necessary, steel plates extend down on either side of the rail from the truck of the car, and the guide wheels running along the side traction faces of the rail are secured to the steel plates, as illustrated. The guide wheels, it is claimed, maintain the car in an upright position at all times, and absolutely secure the car to the rail so that the car cannot jump the track. The electric rail furnishing power for the cars is below the street surface, and the only evidence of a car line in the street being one rail and a slot on either side of the rail. This is very nicely illustrated by the end section.

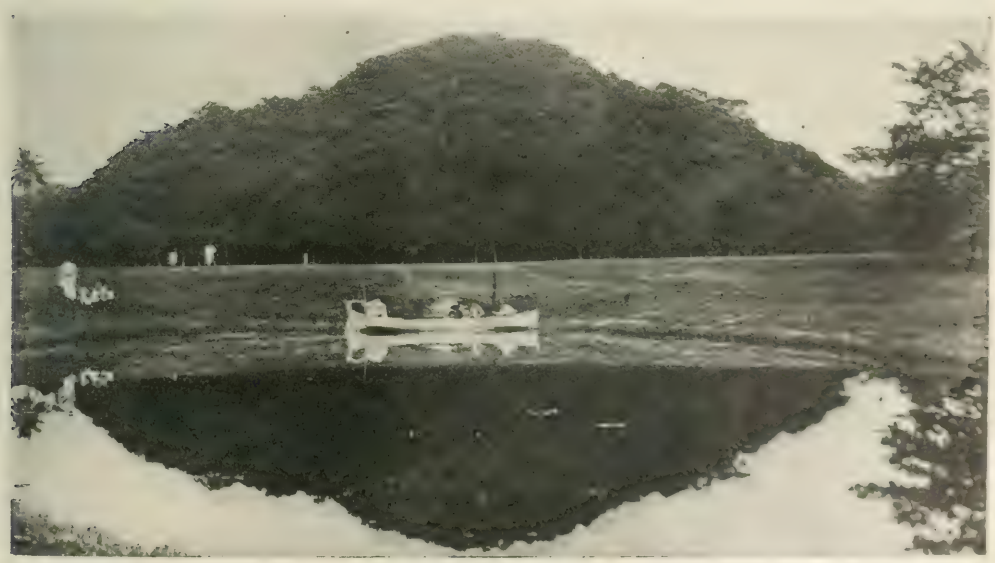
This rail was originally designed for a tramway. A mine, situated in a remote district of the west, required some means for bringing the ore to a railroad and taking back supplies, that would be more efficient and cheaper than transportation on mules' backs. The topography of the country was such that the cost of building a railroad was almost prohibitive. An engineer was consulted and he designed a single track tram to follow more or less the mule trail and to be operated by steam. The inventor was persuaded by friends that he had really originated a new railroad system and that it should be developed along broader lines. The new monorail is the result.



A Concrete Potato Peeler.

A TREE THAT IS A GROVE

MOST children have heard of the banyan tree, which is native to the tropics of Asia. Here is a picture of one. As may be noticed, it is a whole grove in itself. The branches, as they develop, throw down vertical stems which take root in the ground and become supplementary trunks, thus extending the growth over an indefinite area.



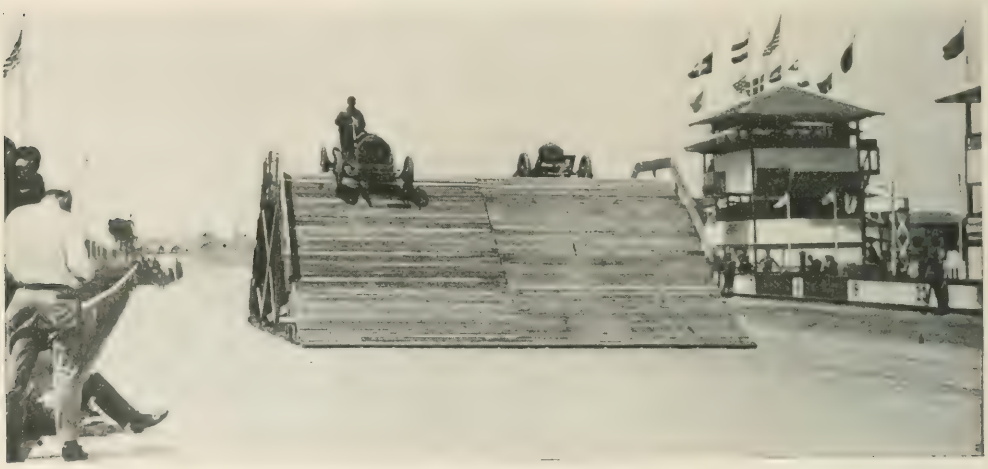
A TREE THAT IS A GROVE.

The banyan tree whose branches send down vertical stems which take root and become supplementary trunks, covering a wide area.

EARRINGS EXTRAORDINARY

EARRINGS OF A BORNEO BELLE.

THE most remarkable earrings in the world are found in Borneo, where women stretch the lobes of their ears by piercing them and attaching weights of brass or iron to them. The process, in fact, is begun in childhood, so that the possessor of these highly decorative ears, by the time she is grown to womanhood, has ear-lobes perhaps as much as a foot in length. In the accompanying photograph (taken by Dr. H. H. Furness, of Philadelphia), the brass weights fastened to the ear lobes weigh a pound apiece.



AUTOMOBILES CLIMBING ARTIFICIAL HILL AT THE INDIANAPOLIS SPEEDWAY.

AUTOMOBILE HURDLE RACE

ONE of the most spectacular features of the May meet at the Indianapolis Motor Speedway was the hurdle race between six motor cars. Two "wooden mountains" were placed on the course in front of the judge's stand and two more were set up a mile and a half along the track in front of the "bleachers." The angle of incline of these obstacles was about fifty degrees and the height was twenty feet. The top of the inclines was curved just enough to keep the fly wheels from hitting when the front wheels were on the decline and the rear wheels still on the incline.

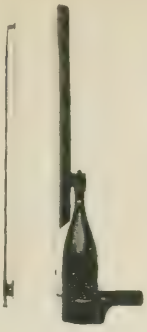
The hurdles were taken at top speed and without any accident, one of the contestants making the two ascents and traveling two miles and a half in 3:38. The "rough riders" who contested in this race were professional testers, whose business it is to try out automobiles over rough roads, so that no defective car will get on the market. The photograph shows two automobiles taking a hurdle and an idea of the conditions of the test may be gained from it. The cars of course had to be in the very pink of condition to make any showing in the contest.

WRECK OF S. S. *Czarina* SHOWING MEN CLINGING IN RIGGING. BUT ONE MAN WAS SAVED OF THOSE ON BOARD.

TRANSPORTING A LOCOMOTIVE

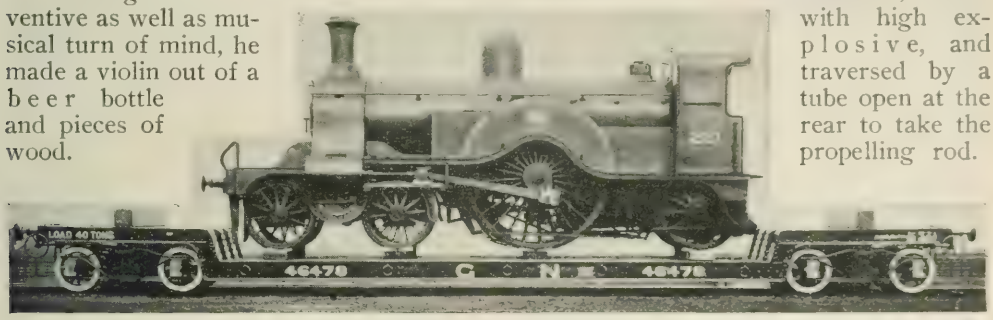
THE Great Northern Railway Company of London recently conveyed one of their new locomotives from their works at Doncaster to an exhibition in London, on a specially powerfully-built truck. The locomotive weighs 110 tons.

VIOLIN FROM BOTTLE



THE MUSICAL BOTTLE.

THE accompanying photograph shows a home-made musical instrument, the work of an English cotton operative, who resides near Manchester. Being of an inventive as well as musical turn of mind, he made a violin out of a beer bottle and pieces of wood.



A LOCOMOTIVE CAR.

ENGINEERS WORK UNDER DIFFICULTIES

THE American locating engineers who are surveying the route for the Southern Pacific Railroad of Mexico which is being constructed down the Pacific slope of that country are terribly annoyed at times by mosquitoes and other insect pests. In the tropical portions of the state of Sinaloa and the territory of Tepic mosquitoes and other winged insects are so numerous and vicious that the engineers carry on their work with their heads wrapped in white cloths. When their hands are not in use they are also shielded against attack by the insects by heavy gloves. Many wild animals are also encountered by the locating engineers in running the lines of survey through the wilderness of tropical forest and brush.

AMERICAN ENGINEERS IN MEXICO PROTECTED FROM INSECT PESTS.

GUN NEVER LOADED

A NEW shell for siege ordnance has been devised by the Krupps. The shell is placed at the muzzle and is driven by a rod which projects from the shell and enters the bore. This projectile is a thin sphere of steel, 15 inches in diameter, filled with high explosive, and traversed by a tube open at the rear to take the propelling rod.

IMPROVED METHODS OF LIFE SAVING NEEDED

THE use of gasoline-propelled non-capsizable life-boats is now fast becoming universal, the range of the Lyle gun is being increased; yet the loss of life by reason of wrecks along our coasts is distressingly frequent.

When the steamship *Valencia* was wrecked a few years ago upon the rocky shores of Vancouver Island with a loss of 137 lives, the beach was but a short distance away and ocean-going vessels steamed back and forth so near the doomed ship that those who had taken refuge in the

"The Conquest of the Air."
Seen at a carnival, London, England.

rigging could be plainly seen. Yet the rough character of the coast and the tremendous sea running, precluded all possibility of rescue.

On January 12th, 1910, the coal-laden steamship *Czarina,* while leaving Marshfield, Oregon, for San Francisco, was disabled by the tempestuous sea, and grounded upon the Coos River Bar, not far from shore. The mountainous ocean breakers were soon making a clean breach over the ship, and those aboard were forced to take refuge in the rigging. The life-saving crew stationed near by were speedily at work and endeavored repeatedly to shoot a line over the wreck, but the distance was too great. Attempts were made to launch the lifeboat, but so heavy was the surf that the boat was smashed and rendered useless. Word was sent to the revenue cutter lying at Astoria, but the raging hurricane did not permit her going to the assistance of the grounded vessel. Left to their fate, those on board the *Czarina* dropped into the sea, one by one. Thirty perished and only one reached the shore alive.

An Eighteen-Inch Tree Cut Down by Bullets.

Here was a case where every means of rescue known to the live-saving service failed; and in view of the fact that such accidents are liable to happen frequently during the winter months along our coasts, it is to be earnestly hoped that the inventive genius of our country will soon devise methods by which this distressing loss of life may be avoided or be at least to a very considerable extent lessened.

A BROADSIDE OF TEN TWELVE-INCH GUNS BEING FIRED FROM THE BRAZILIAN BATTLESHIP, *MINAS GERAES.*

VICTIM OF POOR MARKSMANSHIP

AT Fort Worden, lying at the entrance to Puget Sound, for several years there was no embankment placed in the rear of the targets on the target range. Consequently, every bullet that missed the targets went whizzing into the belt of timber in the background. In the course of time the trees standing directly back of the targets became riddled with bullets and not long ago several came crashing to the ground, having been literally shot down by the bullets that had gone wild. The tree shown in the reproduction was 18 inches in diameter, while the bullets that caused its downfall were the regular 30 calibre Springfield variety.

As it was desired to preserve the grove as a screen, a high embankment has been lately constructed back of the targets to preserve the trees and to protect those who get in the zone of fire.

DIGGING ANTHRACITE BY STEAM SHOVEL AT LATIMER, PA.

EASY MINING

IN the two cuts printed herewith are shown the remarkably favorable conditions for digging in a coal mine recently developed by the Lehigh Valley Coal Company at Latimer, near Hazelton, Pa. The place is termed a "stripping" because the surface soil and rock have been stripped off, and the coal bared so that it can be taken out by steam shovels. The cost of this great excavation was about a million dollars, but it has exposed a thirty-foot bed in an area a half-mile long by one hundred to two hundred yards wide. The coal lies in a shallow basin and at one end nearly one hundred feet of cover had to be removed. The coal is anthracite of the finest quality, and the daily production is about 3,500 cars of two tons each. The cost of mining is at a very low rate of about forty cents a ton, but when the original cost of the property and stripping are considered

THE GREAT STRIPPING OF THE LEHIGH VALLEY COAL COMPANY.

Rubbing Noses.
Maori substitute for a kiss.

and the breaking and shipping to market are added no great profit remains.

TEETH SUPPLIED BY HIPPOS

FALSE teeth nowadays are made of porcelain. In earlier days they were of ivory usually, and many of our great-grandfathers may be said literally to have chewed with the tusks of an elephant. The set of teeth shown in the accompanying photo is of hippopotamus ivory—the "uppers" being all in one piece, and the "lowers" likewise. It is an interesting relic, and is preserved in the Army Medical Museum at Washington.

LOVE AMONG THE MAORIS

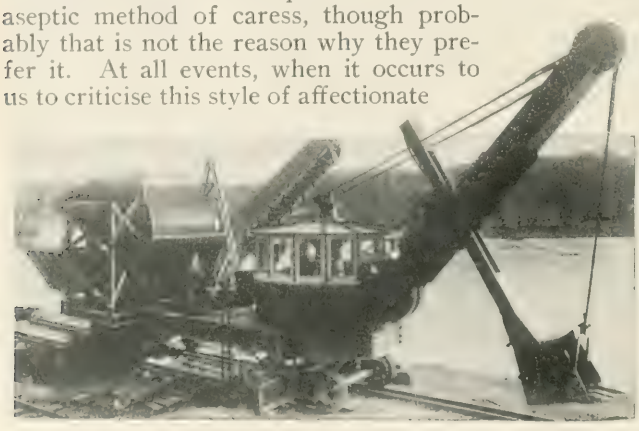
KISSING is by no means a universal custom. The Maoris of New Zealand rub noses. Perhaps it is a more aseptic method of caress, though probably that is not the reason why they prefer it. At all events, when it occurs to us to criticise this style of affectionate demonstration, we should realize that we do not know how to practice it as the Maoris do. It must be done in a particular way, which they alone understand, in order to produce the requisite effect. A sublimated "nuzzle," one might call it.

MINING ON WHEELS

A NEW dredge has been built for recovering gold from California placer grounds. The machine runs on a railway track and comprises an electric shovel to handle the gravel and a gold saving device. The cut shows the boom and dipper extended from the revolving turret; the hopper which receives the material from the dipper; the grizzly, or cylindrical separator, which passes the boulders and coarse material through it out to the endless carrier and to the dump, and the double, or "W"-shaped tank, in the waters of which the grizzly revolves, about one-third submerged.

False Teeth of Hippopotamus Ivory.

The tank is the main feature of the gold saving device. Its two pointed bottoms are supplied with a series of nozzles which discharge upward powerful jets of water. As the "pay dirt" is washed through the steel rod mesh of the grizzly and falls into the tank, it is caught and tossed upward and outward in the water. The four sloping sides of the tank are lined with 2,500 pans or receptacles for mercury, and as the pay dirt is thrown upwards and outwards against the mercury pans, several hundred times, there is little opportunity for gold contained therein to escape amalgamation. Gold of all degrees of fineness is thus



A New Gold Dredge.

recovered in the mercury. About 75 per cent of all gold in placer grounds is invisibly fine, or flour gold, and is not recoverable by ordinary processes.

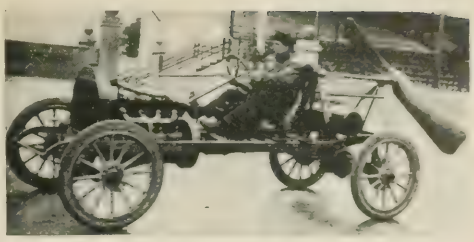
The machine is self propelling, the operator in the picture being at the traction lever. It was built at Highbridge, New Jersey, by the Taylor Iron Works, and is designed for installation in California. A train of fifteen cars, or gondolas, will be required for its shipment.

CONCRETE WATER TANK

THE University of Arizona in Tucson has just installed on its grounds an attractive, tower-like water tank of reinforced concrete. Its artistic appearance is in marked contrast to the old-fashioned style of wooden tank, mounted on trestles and usually rusty, leaky and insecure. The base of the tank proper is arched and the top rises to a dome somewhat resembling that of an observatory.

CONCRETE WATER TANK ON GROUNDS OF THE UNIVERSITY OF ARIZONA —TUCSON.

The details of the construction of this unique tank, given by President K. C. Babcock, are as follows: "This tank was designed by our professor of civil engineering, Prof. Leslie A. Waterbury, who supervised its construction by a local contractor of Tucson. The contract price was $2,551. The time of construction, owing to many delays, extended over several months, but the main part of it was done in about two and a half months. The capacity is approximately 60,000 gallons. The diameter of the circular tank is 25 feet; the walls are four inches in thickness on a one foot eight inch foundation; the base of the lower dome or floor of the tank proper is eighteen feet from the ground; the bend around its base is one foot six inches high, twelve inches wide and reinforced with twelve one inch square twisted steel bars. The tank proper from the base of the lower to the base of the upper dome is eighteen feet. The main walls are reinforced with half inch square bars three inches center to center up to twelve inches center to center at the top. The contract price included all piping, manholes, etc., complete."



THE WIND WAGON.
Used at Indianapolis motor speedway aviation meet, and raced against Wright Bros.' aeroplane.

FARMING THE ZEBRA

IN German East Africa a zebra ranch has been formed, where these beautiful striped African "horses" are being broken to harness. The governor,

A STRIKING GLIMPSE OF THE GREAT GRAY AUSTRALIAN KANGAROO AT THE NEW YORK ZOOLOGICAL PARK.
Showing the short, dangerous fore arms of the creature.

Count Götzen, now habitually rides a zebra mare which has only taken three months to break to the saddle. The species of zebra seen here are, of course, the common mountain variety. Only three species of these creatures exist: Buchell's zebra, so named after the explorer that discovered it; Grevy's zebra, named after the president of the French Republic to whom the late King of Abyssinia sent the first species seen in captivity; and the common mountain zebra. Each differ from the other in the pattern of the stripes. It is the belief of the Germans that the zebra can be tamed and made to work like an ordinary horse.

Breaking Zebra into Harness.

STUDENTS' MOTOR-CAR

An English auto club has had a motor car built for it especially for teaching auto drivers. It is equipped with an extra set of brake and clutch pedals and levers so that the car can be completely controlled by the teacher no matter what the student does. It is also equipped with a "decellerator pedal" so that the teacher can slow down the engine when necessary.

Old-Fashioned Tape Loom.

CLEARING ALASKAN RAILROAD

A SNOWFALL of twenty to forty feet on the White Pass & Yukon Railroad, entirely blockading the track, is by no means a rare occurrence. It is sometimes necessary for all the passengers on the train to take a hand with a shovel and pick in clearing the track so that the rotary snow plow can complete the work. The railroad company does not take this service into consideration as payment for fare, but in the majority of cases passengers prefer to do the work rather than to remain blockaded for a long period of time, so far from a base of supplies or the warmth and comfort of a hotel or, possibly, the snug quarters of a home.

Snowfall Blockading Alaskan Railroad Track.
The passengers all take a hand.

WHEN TAPE WAS MADE BY HAND

NOWADAYS one can buy half a dozen yards of tape for five cents. But when our great-grandmothers were young women, it was different. They used to make their own tape—that article being as necessary then as it is today. They used for the purpose a simple apparatus known as a tape loom, such as that shown in the accompanying photograph. Tape-making took time and trouble in those times, but that was an epoch when every household was literally a factory.

TO HUNT SHARKS FOR OIL

SHARK fishing on a commercial scale is the newest and most unusual of the Hawaiian industries, the scene of the operations of the new company being at Kawaihoe.

Captain F. D. Walker, of Honolulu, a retired sea captain, is now engaged in making arrangements to embark in the business on an extensive scale. His idea is to catch sharks for the purpose of trying out the oil.

Captain Walker states that he possesses the secret of deodorizing shark oil, which is naturally very strong and rank in odor. All this disagreeable smell he claims may be entirely eliminated by his secret process. Walker claims that he is the only one who possesses this secret and he is very confident that in the knowledge he has the basis for a fortune.

He proposes to market the deodorized shark oil to be used as a medicine. The properties of the oil are claimed by high medical authorities to resemble those of cod liver oil, the most of which in reality is made from the dog fish, a near relative of the shark tribe.

The skin of the shark can also be converted into very strong and durable leather that may be used commercially in various ways. The outcome of Captain Walker's new industry will be watched with no little interest by the public.

SHOWING BULLETIN DISPLAY.

MACHINE FOR DISPLAYING BULLETINS OF NEWS IN WINDOWS OF N. Y. *Times*.

CROWD READING ELECTRIC BULLETIN BOARD.

MAGNETIC LAMP

AN electric torch for inspecting automobile engines has been lately marketed. The body of the lamp is an electro-magnet and will hold it in any position against iron or steel so long as the lamp is lighted. It is operated from the sparking battery.

LATEST BULLETIN SERVICE

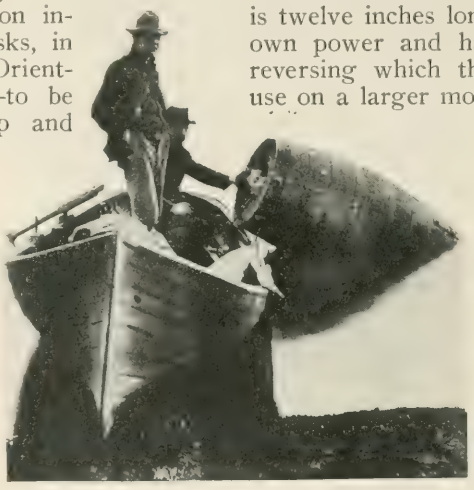
THE New York *Times* has installed an electrical bulletin board in front of its building, said to be the first of its kind in the world to be put in use in this way. The thing is known as an electric bulletin press and prints bulletins in front of onlookers in letters an inch and a half high with nothing in sight to show how it is done. By the use of the new device, the great waste of time and trouble in laboriously printing bulletins, letter for letter by hand, is entirely

done away with. By the use of the new press, a typist sits at his desk, wherever it may be, and writes the bulletins on his typewriter, the keyboard of which has electrical connection with what is known as a sunflower electrical selector, a controlling part of the bulletin press. An additional feature which, among many others, allies the bulletin press closely with the stock ticker is that many bulletin presses may be operated from the same typewriter, all printing the same bulletins simultaneously.

SMUGGLED CHINAMEN

MANY ingenious expedients are resorted to for smuggling Chinamen into the United States. One dodge recently discovered by the Bureau of Immigration involved the use of casks, in which the pig-tailed Orientals were set afloat—to be afterwards picked up and hauled ashore.

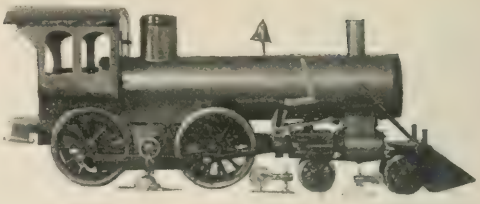
In the accompanying picture, the place of the Chinaman has been taken by a woman, who, as will be noticed, is looking out at one end of the cask.



QUEER MODE OF SMUGGLING CHINAMEN.

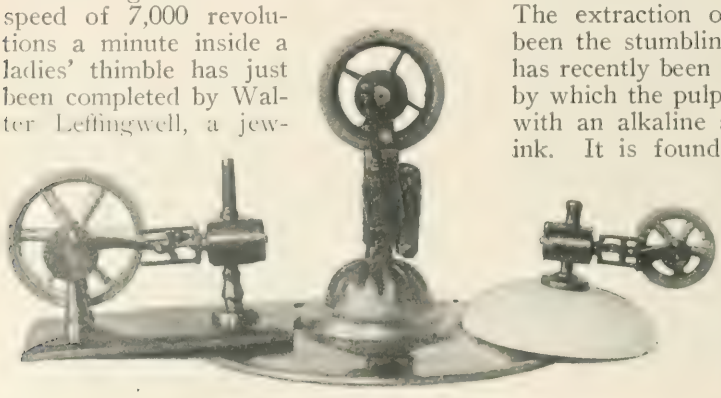
TINY ENGINE

A STEAM engine, capable of running at a speed of 7,000 revolutions a minute inside a ladies' thimble has just been completed by Walter Leffingwell, a jeweler of Peoria, and is believed to be the smallest in the world. Five years of spare moments were consumed in perfecting the device which mechanics say is perfect. Steam is fed through a tiny rubber tube. The engine contains twenty-five pieces.



LEFFINGWELL'S MINIATURE STEAM ENGINES.

Leffingwell has constructed three other small engines and hopes some day to make a still smaller one. The locomotive is twelve inches long, will run under its own power and has a special plan of reversing which the inventor hopes to use on a larger model sometime.



ACTUAL SIZE OF MINIATURE ENGINES.

OLD NEWSPAPERS MADE NEW

IT has long been the endeavor of paper manufacturers to find a process by which old newspapers could be reduced to a pulp, the ink extracted, and the pulp made into white paper again. The extraction of the ink has always been the stumbling block, but a method has recently been discovered in Germany by which the pulp is successfully treated with an alkaline solution to extract the ink. It is found that paper pulp thus treated will no longer hold the lampblack or other pigments of the ink and they are easily extracted. This will add to the value of waste paper and will make it possible to use the same material more than once.

MISSION USED AS HOTEL

ONE of the most picturesque hotels in the country was formerly used as a mission in the early days of Arizona. It stands in the old plaza in the heart of Tucson and except for the absence of the two towers presents much the same appearance as it did in the days of the padres.

The interior has been remodeled slightly to accommodate the visitors to the "Old Pueblo," the chapel serving as a dining room, while the cells of the monks are now used as sleeping quarters for the guests.

HOTEL SAN AUGUSTINE.

THE CYCLO-RAIL

THE tricycles and quadricycles so far constructed for use on railroads all travel on wheels similar to those of ordinary cars, and are far too heavy and bulky to admit of any more general use. A French railway official, Mr. Loewenguth at Rochefort, has designed an ingenious attachment which can be fitted on any ordinary bicycle, allowing of its instantaneous conversion into a vehicle for traveling on rails.

THE "CYCLO-RAIL" DISMOUNTED.

INSPECTING THE TRACK WITH THE "CYCLO-RAIL."

As inferred from the accompanying illustrations, the "Cyclo-rail," as the apparatus is termed, consists, first, of some sort of fork fitted to the front of the bicycle, and which embraces the rail, with slight friction, and secondly, of a lever, the end of which carries a roller traveling on the opposite rail of the track. The second part of the attachment is mounted and unmounted at a moment's notice, while the fork is simply lifted while out of use.

The weight of the whole attachment is so immaterial that when traveling on the road, the ease of motion is practically unimpaired, and as soon as the track is reached and the apparatus is set working, cycling becomes especially easy, the equilibrium being absolutely stable, so that the cyclist may stop at will in order to inspect the track as carefully as possible. As soon as a train comes into view he may readily alight from his bicycle, and remove the whole of the apparatus at a moment's notice. A special attachment is provided for traveling in curves, and controlling at will the degree of stability.

Apart from its practical uses, the "Cyclo-rail" will also be welcomed by amateurs to whom it affords a means of making bicycle rides along railway tracks.

SCENES IN THE CAREER OF THE *DEUTSCHLAND*

WRECK OF ZEPPELIN'S AIRSHIP, *DEUTSCHLAND.*

VIEW FROM THE *DEUTSCHLAND* IN FLIGHT.

BOARDING THE *DEUTSCHLAND.*

In June 22nd, the great dirigible made a trip of three hundred miles from Friedrichshafen to Duesseldorf, Germany. On the return trip, with thirty-two people on board, she was wrecked in a wind-storm, but none of the passengers were injured.

HOW COLOGNE LOOKED FROM THE *DEUTSCHLAND.* THE LATEST ZEPPELIN AIRSHIP.

INTERIOR OF ZEPPELIN'S AIRSHIP. *DEUTSCHLAND.*
There were nearly all the comforts of a good hotel.

MEALS IN SMALL COMPASS

THE War Department is just now adopting a new emergency ration for the army. It is intended, of course, for use under conditions in which the soldier is temporarily separated from his command. This might happen, for example, when a squad was obliged to hold some outlying position for a while.

For such contingencies, it is necessary that the soldier shall be provided with food in condensed form, which will weigh as little as possible, and occupy the least possible space in his knapsack. The new ration for emergency use weighs only twelve ounces for three meals—that is to say, for one day's food supply. This includes the tin receptacle in which the three meals are contained.

The three meals are represented by three cakes of what looks like chocolate, each one wrapped appetizingly in tinfoil. It is in truth a mixture of chocolate, sugar, egg, and malted milk. In the picture, one of the cakes is unwrapped, to exhibit it to view.

GARGOYLES OF LA JOLLA

ONE of the most fantastic and beautiful specimens of Nature's carving is seen on the cliffs of La Jolla, California, where the soft stone has been eroded by the waves and weather until it resembles the facade of some medieval cathedral. There is a suggestion of cloistered columns and buttresses in the detached and semi-detached masses of rock, while certain harder strata have a striking resemblance to gargoyles, as the projections overhang the vertical face of the cliff.

THREE CAKES WHICH REPRESENT THREE MEALS.

ONE OF THE CLIFFS AT LA JOLLA.

PSYCHOLOGY AND CATS

SEVERAL American universities have established laboratories for experimental and comparative psychology and have already furnished facts and proofs of great interest.

Harvard and Johns Hopkins Universities began simultaneously to try to solve the question as to whether the education of animals is accomplished by the gift of imitation or by the force of instinct.

Although it is generally admitted that it is the nature of a cat to hunt and kill mice, Dr. Berry of Harvard has demonstrated the reverse of this theory.

Three kittens five months old had been closely guarded from contact with the outside world. One of them was placed in a cage with a mouse. It commenced by sniffing the air, expressing a vague uneasiness, when it caught sight of the mouse, ran after it, and an interminable game of hide and seek began, during which the young feline did not once put out her claws. After an hour the mouse was taken out of the cage; it had not received a single scratch. The two other kittens were submitted to the same experience and conducted themselves in the same manner as the first.

MAKI AT TELEPHONE.

The experiment was repeated six weeks later, this time to make a more decided proof, the kittens had been allowed no food for 24 hours. But the mice again were taken out without having received the slightest injury.

Now it became interesting to find whether the kittens would profit by maternal lessons. One was allowed to play ten minutes with a mouse, the mother then being placed in the cage, without any formality, fell upon her prey, killed and ate it, under the attentive eyes of the kitten. After finishing her feast, she was taken out of the cage. A new mouse was introduced, also another kitten, and they played to their hearts' content. Finally one of the kittens was removed and the mother placed again in the cage, and killed the mouse in a hurry. But this time she let the kitten take the body in its teeth, an appetite was created, and the kitten did not have to be urged to finish the unexpected feast.

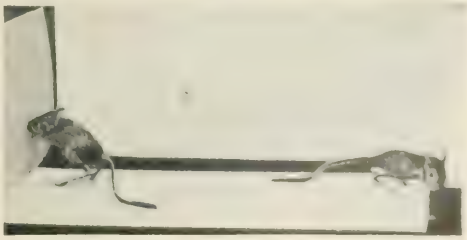
MICE WALKING WIRE.

Again with the same subjects some pieces of meat were placed in a milk bottle on a bed of paper which raised them to the desired height. The mother succeeded in taking them out after a few attempts. One kitten imitated her very quickly; the two others, after several repetitions of the example, learned to accomplish the feat.

Professor Haggerty, collaborator in the same laboratory, gives an account of some complicated experiments with monkeys, proving that they vary greatly in degrees of intelligence as well as in the power of imitation.

Pursuing patiently their laborious studies, these laboratories are now taking for subjects, animals of less intelligence than cats and monkeys. As shown in our photographs, they are going to work with animals of different kinds, hoping to discover whether the gift of imitation can be manifested between different species. By seeing mice walk on a wire, will a

SNAKE LEARNS TO WALK THE WIRE AFTER SEEING MICE DO THE TRICK.



AN EXPERIMENT IN [illegible].

Arizona Chauffeuse and Her Car.

Esquimaux Boys Learning to Smoke.

serpent conceive the idea that he may also venture upon this unsteady road in the hope of finding prey?

After having seen a dog bark at the telephone and receive a piece of meat as reward, will a maki repeat the same act in order to obtain a morsel of banana? And may analogous processes lead the zebra to execute, by command, waltzes or quadrilles?

These new experiments are still in their infancy and simply indicate at present, the general trend of the investigations but promise to open up a vast field for experimental work in the psychology of the lower animals and of man, as well. Vital new truths concerning the mind may be discovered in the course of these experiments.

Australian Emu, Now Almost Extinct.
About to take a bit of banana from the mouth of keeper in New York Zoological Park.

A SOUTHWESTERN CHAUFFEUSE

THE pioneer spirit is not dead in the women of the frontier as is shown by the courage and enterprise of this Arizona girl who is part owner of a garage in a Western mining center.

In her capacity of "chauffeuse" she regularly undertakes long trips over the desert and mountains to distant mining camps in Arizona and Old Mexico. Although her weight is not much more than one hundred pounds, this plucky little woman has extricated her car from many a washed out hole in the road, jacked it up to repair a punctured tire and done more heavy work than most chauffeurs in more settled communities would undertake in a life time.

Her costume is not designed for style but for hard service and consists of a riding costume of khaki with divided skirt.

THEIR FIRST CIGARETTE

THIS photograph was taken on the U. S. revenue cutter *Bear*. The boys are Esquimaux. One of them, who is the eldest, is teaching the other two to smoke cigarettes—the tobacco doubtless having been furnished by some member of the crew of the cutter. Anyhow, the two little fellows are experiencing those effects of a first smoke which are only too familiar to most of us. Nothing in the world makes one feel sicker, for the time being. Fortunately, however, the Esquimaux will not allow their womenkind to use tobacco in any form; they consider it too good to be wasted on women or very small children.

GROWS TOO FAST FOR A PHOTO

THIS is a very curious fungus, discovered by Mr. David G. Fairchild, head of the government Office of Plant Introduction, in the jungle of Java. It is called the "net-bearer," on account of the peculiar net-like veil by which it is surrounded, and attains a height of six or eight inches.

Describing this fungus Mr. Fairchild says: "I tried to photograph it by time exposure, but failed, for the reason that it grew so rapidly during the exposure that the outlines were blurred on the plate! The accompanying photograph was accordingly taken by 'quick exposure,' a very short time exposure, almost a snap-shot.

"The 'net-bearer' propagates itself by the help of insects. Its whole appearance is designed to appeal to the eyes and appetites of flies. The hood at the top of the stem consists of a greenish, sticky mass, that gives out a vile stench of meat in the last stages of decay. This odor attracts swarms of flies, which gorge themselves on the mushroom. Incidentally, they eat millions of mushroom spores, which are deposited elsewhere, and provide for the propagation of the species."

BARBED BONE ARROW HEAD FOUND IN THE BREAST OF A WILD GOOSE.

THE "NET-BEARER" FUNGUS.

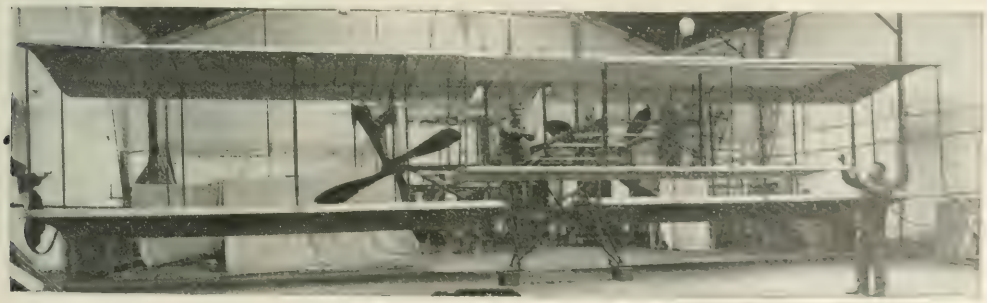
STORY OF A GOOSE

THIS is the breastbone of a wild goose which was shot on the Kankakee Marsh, in Lake County, Indiana, by a farmer. It was just an ordinary goose, but the remarkable thing about it was that the breastbone of the bird was found to be transfixed by a bone arrowhead, presumably shot by an Indian marksman. The arrowhead was nine inches long and five-eighths of an inch in diameter.

Evidently the goose had carried the arrowhead for a long time—certainly for many months, inasmuch as the wound made by it had entirely healed long before the bird finally met its death.

LARGEST AEROPLANE EVER BUILT

THE world's greatest aeroplane, built to have a carrying capacity of eight persons, has just been completed in France to the order of the De Dion-Bouton firm of automobile manufacturers, who have constructed the engine for it. The dimensions of this great machine are: Width, from tip to tip of wings, sixty-five feet; length over-all, forty-seven feet; breadth of wings from front to rear, eight feet; weight, without motor or



THE DE BION-BOUTON EIGHT PASSENGER BIPLANE.
The largest flying machine ever built

transmission mechanism, about seven hundred and fifty pounds. Like the Wright fliers, the machine has two propellers, but instead of two blades each has four blades which describe a circle having a diameter of ten feet five inches. By means of a special form of transmission embracing a differential and reducing gear, the two propellers will be driven at a speed of four hundred revolutions per minute. The woodwork of the aeroplane is all American spruce, the pieces being split lengthwise and hollowed out and then glued together and wrapped with varnished canvas, thus making them very light and strong.

Lateral stability is secured by means of movable planes which the French call *ailerons,* placed between the main planes and extending out beyond them on either side of the machine, as seen in this country on the Curtiss aeroplanes and others.

London's Rubber Boom.
Carrying old tires to jobber in hopes of getting rich quick.

COLD SNAP WRECKS TRAIN

PERHAPS one of the strangest causes for a railway accident that was ever assigned was that of "a quick change in temperature," that being the gist of the official report on the wreck depicted in the cut.

Early in the summer at the caprice of the New England weather the mercury was driven down to close to the freezing point and the following day it mounted to its usual early summer height of some 67 degrees. As a result the first local train out the following morning went into the ditch near Lynn, Mass. The quick change of temperature had warped the rails by the sudden expansion and contraction, thus allowing the rails to spread and send the first train in the ditch.

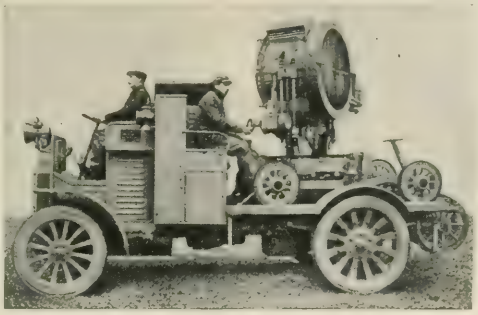
Luckily the wreck shown resulted in no fatalities, though two cars and the locomotive went off the rails.

TRAIN ON A NEW ENGLAND ROAD DERAILED BY A "SUDDEN CHANGE OF TEMPERATURE."
The rails were warped by sudden contraction and expansion.

MONSTER AUTO SEARCHLIGHT

THE automobile is destined to play an important part in modern warfare and has recently contributed to the scouting and signal service.

Researches made by students in the technical section of the French artillery have resulted in the creation of electric searchlights mounted on automobiles. They differ from other machines in the employment of a dynamo joined directly to the motor. The projector, with all the means of control which accompany it, is installed on a wagon with four wheels, quite independent of the automobile which serves only for transporting it.



FRENCH MILITARY PORTABLE SEARCHLIGHT.

When the automobile carrying the projector with its apparatus arrives at its destination, the light is taken from the platform by the aid of tackle. A flexible cable, the usual length being 300 feet, which may be replaced by another as long as desired, is connected to the dynamo of the projector. Thus the wagon carrying the projector may be installed at almost any distance from the automobile. The control may be effected at a distance, and if for any reason one of the electrical machines refuses to perform its functions, the light can be turned by hand.

The portable controller is enclosed in an aluminum box, provided with a strap and braces which allow the man in charge absolute liberty of his movements.

The wagon carries three motors by which the monster lamp can be turned so that the brilliant beam may be thrown in any direction. These motors are controlled not directly by the current.

TEACHING FIREMEN TO SAVE LIVES.

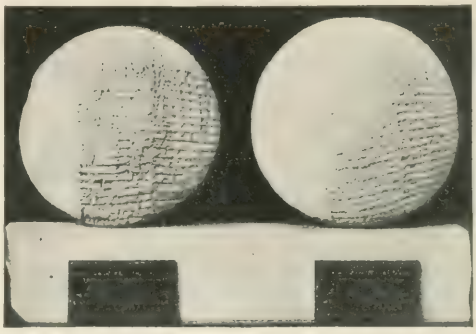
Showing the future firemen how to shoot the life gun. Firemen being taught how to [illegible]

MATSUI, THE CHAMPION TOP SPINNER.

but by means of relays worked by the portable controller. Two minutes after arriving at its place of destination the projector can be in operation throwing a light by which one can see at night objects at a distance of two miles.

TOP-SPINNING EXTRAORDINARY

OF the numerous Japanese entertainers in London few are attracting more notice than Matsui, who claims the distinction of being the champion top-spinner of the world. He is the sixteenth descendant of the great Matsui, who spun tops for the amusement and edification of the then ruling Mikado, who was so charmed and delighted with his exhibition that he presented the top-spinner with a parchment entitling him to the post of Royal Top-Spinner to the Emperor. The present Matsui is certainly a marvel. He can spin a top on the point of a needle, along the blade of a sword, round the edge of a fan, along a piece of string, up and over the top of a thin bamboo cane, the spinning top appearing almost to be endowed with human intelligence in the hands of its master. Throwing the top into the air Matsui catches it in his hand and then sends it up his arm, round the shoulders, and down the other arm, the top meanwhile continuing its revolutions.



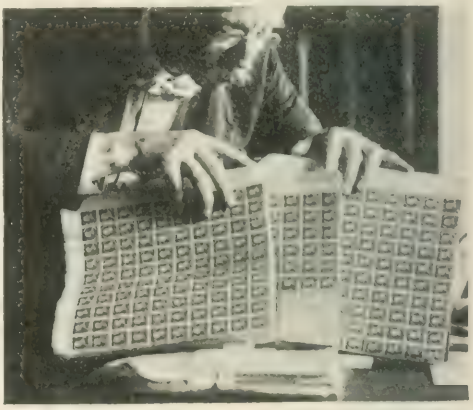
ANCIENT BABYLONIAN CLAY TABLETS INSCRIBED WITH A SURVEY OF CERTAIN PROPERTY DURING THE REIGN OF BUR-SIN, KING OF UR, ABOUT 2350 B. C.

SOAKING SPOILED STAMPS

THE government has a lot of trouble in hot weather with postage stamps that get stuck together. Often this sort of accident, at postoffices in various parts of the country, renders useless large quantities of stamps, and it is necessary to send them back to Washington to be redeemed.

During July and August, work of this kind occupies the entire attention of two or three men. Occasionally 20,000 or 30,000 stamps will arrive in a batch, the sheets all stuck together and thereby rendered unsalable. The only way to deal with them is to soak them apart in water, whereupon they are counted and replaced with fresh ones at no cost to the senders.

The illustration is from a photograph showing a batch of 20,000 stamps which was redeemed at the Post Office Department in Washington.



20,000 "STUCK" STAMPS AT THE POSTOFFICE DEPARTMENT IN WASHINGTON.

CONVICT'S DEVICE CHECKS DISHONESTY

A CONVICT now serving a twenty-year term at San Quentin has invented an "anti-forgery machine" which will, it is claimed, prevent check raising or forgery and eliminate the passing of scalper's tickets on the railroads. By means of a secret code indicated by what appears to be haphazard perforations on the face of the check or other paper, its face value is indicated and the person to whom it is made payable is identified.

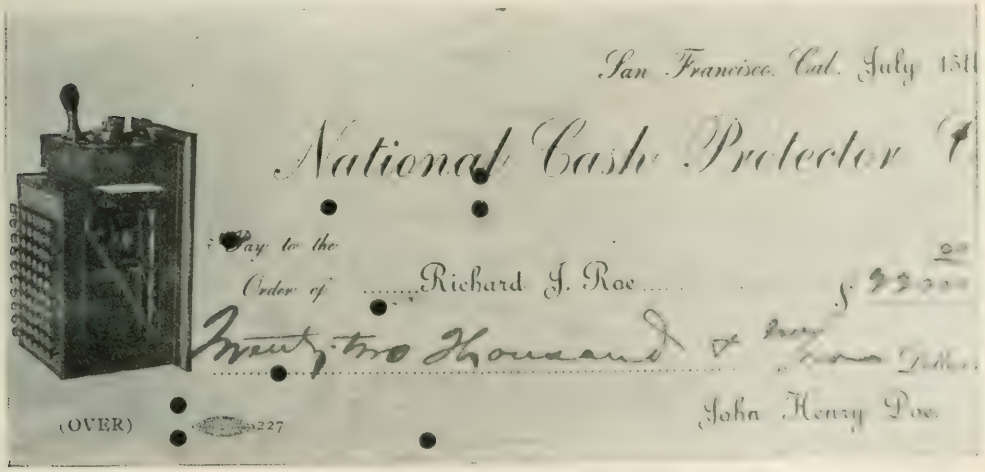
The inventor, Frederick Hoffman, worked industriously on the model of this machine while in the penitentiary and when it was completed he secured the permission of Warden Hoyle to apply for a patent, which has been granted. The device is known as the National Cash Protector and has been demonstrated in the leading banks of the Pacific Coast, receiving indorsements of bank presidents, cashiers and other experts. A description of the machine given out by the inventor is as follows:

"With long rows of numbered keys above, giving it the appearance of the modern adding machine, one must be cognizant of every cipher and code employed by the bank to obtain the desired results. The keys, of which there are seven rows, are numbered numerically from one to nine. The check, draft, money order, bill of lading or whatever paper the operator wishes to mark, is placed in one end of the machine and securely clamped. Keys then are pressed giving the bank's secret mark, the amount of the check and identifying the person receiving the money. When the paper is withdrawn from the machine, however, nothing more is visible than half a dozen round holes, punched apparently at random on the face of the check.

TESTING THE HEART OF A PUGILIST BEFORE HE ENTERS THE RING.

"When the paper in which the holes have been punched is laid upon a piece of cardboard with corresponding rows of numbers the holes fit the numbers punched by the original operator of the machine."

A finger print system goes with the sending of checks to a distant point which permits anyone having checks drawn to his own credit to have the prints embossed on top of the check, and this will not only identify the payee but will be effective in preventing professional criminals from cashing check, as most of them have their finger prints, together with photographs and Bertillon records, on file at police headquarters in all the large cities of the country.



FACSIMILE OF CHECK MARKED BY THE "ANTI FORGERY MACHINE"

The Famous "Limited" Which Runs Between Peninsular Lake and Lake of Bays.

THE "HOT TAMALI LIMITED"

THE most comical railway enterprise of the world is the train known as the "Hot Tamali Limited." This liliputian affair runs on the shortest "through line" in the world and is located away up in the highlands of Ontario, Canada.

When tourists and sportsmen began to discover the beauties and allurements of the Ontario lakes, an enterprising railroad expert called attention to the fact that by building a railroad from the lower end of Peninsular Lake across the few miles of portage, tourists could be set down at the upper end of the beautiful, island-studded Lake of Bays and there would be a practical highway of several hundred miles of lake country established.

The suggestion was adopted and, from the start, the tiny railroad became a tourist feature. The little "back-sided" engine with its trunk car and passenger coach about the size of the old trolley car became a mecca for the visitors and the funny railroad was immediately dubbed the "Hot Tamali Limited." In spite of the Huntsville Navigation Company's effort for a more dignified title, the "Tamali" name stuck fast.

The tourists often make the boat trip clear across the Peninsular Lake solely to secure a ride on the "Hot Tamali" and this railroad joke has become one of the most profitable ventures in the entire Canadian lakes region.

The illustration gives a good view of the absurd little train and its crew.

HAND POLLENATION OF DATE PALMS

SCATTERED along the lower course of the Rio Grande river on the Texas side are many date palm trees. Some of these trees are twenty to thirty years old. Occasionally one of them would bear a few bunches of shriveled dates. It was not until two or three years ago that many of the non-productive trees were brought into full bearing by means of artificial pollenation. Prior to the introduction of this method of making the trees produce an abundant crop of fruit it was generally thought by the people of that region that the palms were of some non-bearing variety. The practice of pollenating the trees by hand has now become general, with the result that large yields of fine fruit are obtained from them each year. Much attention is now being given to the date growing industry in that region and it promises to become a source of considerable profit.

Date Palm Tree in Full Bearing in Texas.

MOST PRIMITIVE OF CARTS

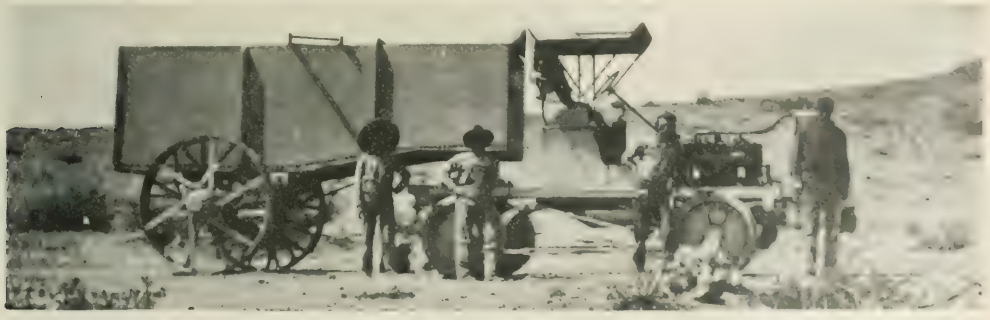
NOTHING more primitive than this in the way of a cart can be found anywhere in the world. It is a Burmese conveyance, and it will be noticed that the wheel represents a very early stage in the development of that idea for transportation.

The body of the top of the cart is made of basketwork, and is highly picturesque. But the queerest thing of all about the vehicle, perhaps, is the animals that draw it. They are zebus—a kind of humped cattle, common enough in southern Asia, but which we never see in this country except at the circus.

BURMESE CART DRAWN BY ZEBUS.

BIG TRANSPORTATION PROBLEM SOLVED

ECONOMICAL and practical transportation of their ores is being sought by many mines in the arid regions of this country and Mexico. Inventive genius has solved this problem so far as it relates to the mines of a company which is operating in Mexico, five miles from the Rio Grande border line. The nearest railroad point to these mines is Marathon, a station on the Southern Pacific Railroad in Texas, eighty-five miles north of the mines. The company constructed an aerial tramway from its working shaft to the Texas side of the international boundary stream. W. G. E. Rolaff, a mechanical and electrical engineer, was then employed to devise an auto truck that would haul the ore from the Texas terminus of the tramway to the railroad shipping station at Marathon. Mr. Rolaff, after investigating the matter, decided that neither a gasoline tractor or an electric truck would be satisfactory. He set to work to combine the two principles and succeeded in constructing a gas-electric truck that performed the ore-hauling service successfully. This new machine makes the run of eighty miles at the rate of four or five miles an hour loaded and eight to ten miles an hour empty. A gasoline engine drives an electric generator which furnishes current to motors. Approximately one-half gallon of gasoline per mile is consumed. The capacity



NEW TYPE OF GAS-ELECTRIC TRUCK FOR HAULING ORE IN THE TEXAS DESERT.

of the truck is fifteen tons of ore. The fact that there is an absolute absence of fuel along the route and that there is only one place in the eighty miles where water is found makes the utility of this new method of heavy hauling very pronounced.

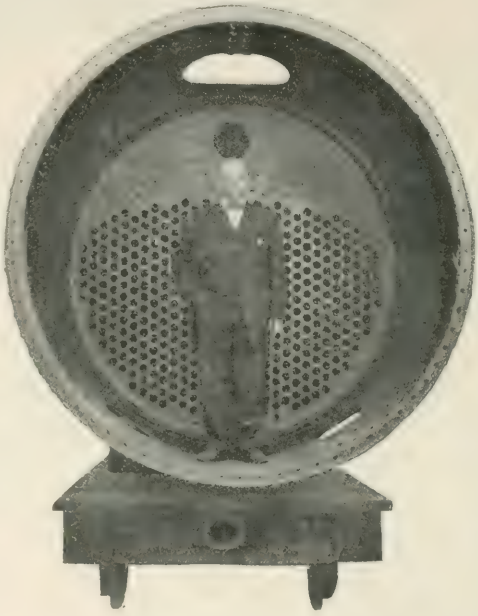
ENORMOUS YIELD OF WEALTH

THE 290 acres of land that are embraced in the Spindle Top, Texas, oil field have a record of producing 45,000,000 barrels of oil during the last nine years. This output had a value of more than twenty million dollars as it came from the wells. Much of the oil was refined, thereby greatly enhancing its value. The field is still producing oil at the rate of about 3,500 barrels a day. This 290-acre tract of land is said to have produced more wealth than any oil field of similar size in the world. Its subterranean output of wealth is exceeded by but few mines.

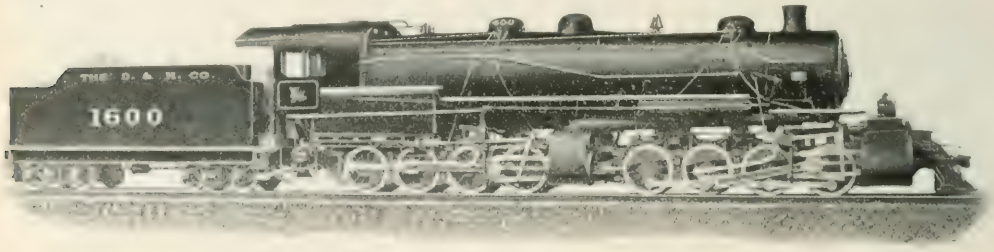
The discovery of oil at Spindle Top marked the beginning of the oil development in the Gulf coast region of Texas and Louisiana. The several fields that have been discovered and exploited in that region since then have a record of production aggregating more than 175,000,000 barrels of oil.

CAPT. LUCAS (ON RIGHT) WHO MADE THE DISCOVERY OF THE SPINDLE TOP OIL WELLS.

Captain Lucas is said to have profited very little personally from his great discovery. He is still employed in the work of locating new oil fields in this country and Mexico, his services being in constant demand by oil operators. When he picked upon Spindle Top as a likely place for oil and began boring the well that turned out to be one of the greatest gushers known in the history of the oil industry, with the possible exception of some of the wells in the Baku district in Russia, he was the subject of much quiet ridicule. In the subsequent excitement over the big discovery, the part that Captain Lucas had played in bringing to light the new source of wealth was forgotten by most of the men who profited by his knowledge.



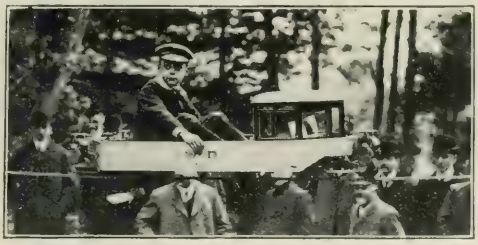
FRONT VIEW OF BOILER OF POWERFUL LOCOMOTIVE.



MOST POWERFUL LOCOMOTIVE EVER CONSTRUCTED.
Articulated compound engine which weighs over 200 tons.

move in all planes would almost completely overcome the roll of the ship from port to starboard though it would not stop the pitching fore and aft. It is the roll that makes all the trouble of seasickness, or at least most of it. The German government lent Dr. Schlick an old torpedo boat, the *Seebaer,* and he installed his apparatus. They took her out to sea one day four years ago. Of course the little torpedo boat rolled and pitched. Then they started up the gyroscope, which was not a perfect affair, not run by electricity but by a steam turbine. At once the rolling stopped. The waves actually seemed to disappear under her and she rose and sank with a gentle motion and rode them as steadily as could be. There wasn't even any spray.

Now the scheme is in successful operation on the *Silvana,* one of the Hamburg - American pleasure boats. It is not likely to be used on great trans - Atlantic liners for the simple reason that they are so big that rolling is negligible. but it could be used and plans are drawn for installing a huge one of several tons on one of our great 26,000 ton battleships. That is going to be done by somebody in a naval battle some day and it is going to wake up the world. It is not speculative; it has been proved practical. It may even be worked out that another differently placed gyroscope may stop the pitching, so that the great rifles can be fired as accurately and easily as from a shore battery.



BRENNAN'S GYROSCOPIC MONORAIL MODEL.
Carrying a passenger over a suspended cable.

Then there is the torpedo. How are you going to keep it aimed straight ahead after you have started it? Brennan got $550,000 for answering that question some years ago. He did it by a clever arrangement of a gyroscope. The Whitehead torpedo also carries a gyroscope. Inside the casing and near the stern an ingenious arrangement of this instrument operates the rudder, thus maintaining the torpedo in its predetermined course. No small part of the destructiveness of the Japanese torpedoes was due to the superior way in which their gyroscopes acted.

Once start a torpedo in the right direction to hit an enemy and it will keep straight to the mark with deadly precision. More than that. Often a torpedo has to be launched not head on in the direction it is to go, but from a side torpedo tube. A gyroscope torpedo can be turned loose in that way. It will itself gradually swing around as it churns its way under the water, make a circle around the torpedo boat that launched it, and than go straight on its appointed way of destruction. In other words it can be fired around a corner.

Then take the tight little submarine. Nobody cares very much about going down in a submarine for a long stay. The great trouble is that when you get down there without even so much as a thin mast sticking above the surface you lose your bearings —the fallible compass goes back on you almost absolutely, and when it is most needed, too. There is nothing to guide you, as there is on the surface. And on the surface, too, during gun fire, and at all times for that matter, the great masses of metal on a warship or passenger ship, the swinging boats, and other things make a compass practically useless without corrections. And below the surface on one of the intrepid little plungers things are even worse, for you never can tell when or how much the compass is lying to you. Again steps in the wonderful little gyroscope and solves all our troubles.

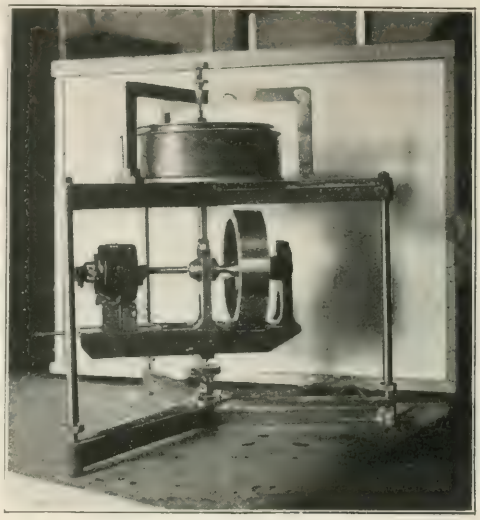
The way it does it is by making possible the gyroscope compass. The magnetic needle may, and often does, lie. North of the north magnetic pole, for instance, it points due south. Not so with the gyroscope compass. Once set revolving with its axis pointing at the north star and all the king's horses and all the king's men couldn't make it perjure itself, providing you keep it revolv-

ing as it is built to revolve. You have only to set it right in the first place. It will stay pointed at a star even when that star is below the horizon. Pick out another than the pole star and the gyroscope will make with it one complete revolution a day.

Then there is the gyroscopic artificial horizon. Often the real horizon is hidden in cloud but by using the artificial horizon it makes no difference. As long as you can find any known star or the sun you can get some idea of where you are, with it. It is possible with such an apparatus and an accurate chronometer to tell latitude and longitude as well as sidereal time.

The gyroscope has even been applied to the clock. If connected by gears to the hands of a clock it will give the true sidereal time. In the control of the telescope the gyroscope is also used. Point it at a given star and it will keep the telescope pointed at the star, too, so that photography can be used and most accurate results obtained.

There are numerous other practical applications of the gyroscope. Thus Dr. Alexander S. Chessin of Washington University in St. Louis, perhaps the greatest American authority on the mathematics of the gyroscope, has recently applied for a patent for an automobile with two wheels. Some day we shall be whirling through the streets automatically balanced like a bicycle rider. The best part of it will be that there will be no skidding on a two-wheeled auto.



An Electric Gyroscope.

Such an auto is by no means a flight of fancy. Dr. Chessin has run it at great speed and claims many advantages for the new machine. It is reported that he has arranged with a well-known company for its manufacture.

"It is the electric motor that has made possible the practical application of the gyroscope," said an engineer recently. "The old gyroscope patents were perfect mathematically. Yet they were physically worthless. Today with the electric motor and the steam turbine applied to the gyroscope we are only just beginning to learn what the gyroscopic age will be."

One Touch of Nature

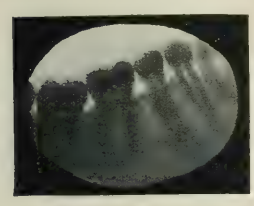
One touch of nature makes the whole world kin—
That all, with one consent, praise new-born gauds,
Though they are made and molded of things past,
And give to dust that is a little gilt
More laud than gilt o'erdusted.

—Shakespeare.

X-RAY APPARATUS FOR DENTISTS

WHEN making a diagnosis dentists heretofore have depended only upon inspection and palpation, and the description furnished by the patient, which in many cases is grossly exaggerated. About the spread and nature of the ailment, the dentist could draw conclusions only from the symptoms, and to find out the real condition of the teeth and the jawbone was very often exceedingly difficult and sometimes impossible.

A Berlin electric company has now placed on the market an X-ray apparatus especially constructed for dentists, with which the old difficulties are overcome as it allows a most exacting diagnosis to be made, as the accompanying photographs show. The apparatus is very simple and can be handled by the dentist without any assistance. It is on wheels so that it can be pulled to the operating chair, and the X-ray tube is attached to a long metal frame in such a manner that it will stay in any desired position. The apparatus is set in operation by pressing a foot-lever which allows the dentist to have both hands free to properly adjust the film.

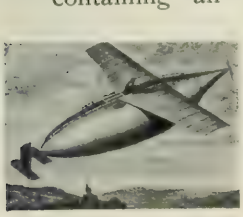


X-RAY PHOTOGRAPHS OF TEETH.

THE LATEST ENGLISH CANE

THE latest English novelty is a cane containing an electric-light, which can be switched on or off instantly as required. The possibilities for using such a stick are, of course, immense, and it goes without saying that it would be serviceable to very many people at night. The flashlight is turned on or off by the metal sleeve just above the lamp and is not noticeable when not in use.

NEW ENGLISH CANE WITH ELECTRIC LIGHT ATTACHMENT.



COMBINATION AIRSHIP.

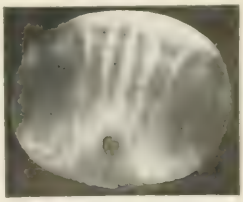
DENTIST APPLYING THE X RAY

COMBINATION OF AEROPLANE AND DIRIGIBLE

NEW and interesting ideas on the subject of aerial navigation are constantly developing. M. Constantini has just invented a new machine to which he has given the name of *aéromobile;* this apparatus being heavier or lighter than air at the will of the pilot. It is at the same time aeroplane and dirigible balloon.

In order that a machine heavier than the air may become lighter at a given moment, while on its course, it is necessary that its volume should increase so as to remove a mass of air, the weight of which is heavier than its own. This is done by enveloping the aeroplane with a balloon which may be inflated when necessary. It is not necessary to carry hydrogen for this purpose as provision is made by heating ordinary air; the gas escaping from the motor furnishes the heat sufficient for this purpose.

The apparatus is composed of an elongated metallic envelope which constitutes the reservoir of ordinary air. Outside of this envelope is added an envelope of canvas which can be inflated with the air from the reservoir which has been heated. The air reaches a temperature of 200°.



X RAY PHOTO OF THE FOOT, SHOWING DISEASED BONES

A Great Collection of Alaskan Big Game. Purchased for $5,000.

It acquires in this way ascensional force sufficient to carry the machine. The aviator can diminish the ascensional force at will.

This machine has the advantage of being able to land at a chosen place and of retarding the fall when necessary.

NATIONAL COLLECTION OF HEADS AND HORNS

THE first inspection of the splendid collection of heads and horns given by the New York Zoological Society to its members, patrons and contributors, was a notable red-letter event for all Nature and big game lovers, sportsmen and the general public who are interested in the horned and hoofed animals of the world. In the two picture galleries of the new administration building of the New York zoological park has been assembled and housed the National Collection of Heads and Horns. This collection forms a marvelous panorama of interesting and rare animal forms gathered from the remotest corners of the earth.

Nearly 1,000 specimens of rare and commanding size, together with many small, but equally important and valuable ones, formed the collection. This collection contains the rarest and most famous of all caribou heads, said to be the record breaking specimen of the world. The caribou was killed in the Cariboo Mountains of northern British Columbia. In size, in weight, length of tines and general outline, this is considered one of the grandest caribou heads in existence. The left antler is fifty and one-half inches in length, the right forty-eight inches in length, having a total of forty-five points. In life this animal is one of the largest and handsomest caribou known, and weighs from six to seven hundred pounds, and lives throughout the year in the high mountains above timber line.

Viewing the collections it is difficult to imagine how so great a number of variations could have been produced, and in fashioning these the ingenuity of Nature seems to have run riot. In the gazelles one sees a wide difference of curves, bends, twists, and spirals that soon becomes fairly bewildering. The onlooker notes surprisingly the smooth and twisted horns of the harnessed antelopes and elands, the slender and ringed horns of the gazelles, the grotesquely bent horns of the hartebeests and white-bearded gnu, most beautiful and most imposing of all. In one of the illustrations is shown the great collection of the big game of Alaska, which is believed to contain specimens of each of the larger species of animals. This collection was purchased for $5,000 but is said to be priceless. The other illustration is a photograph of the tusks of the Soudan African elephant.

Tusks of the Soudan African Elephant.

Technical World Magazine

HENRY M. HYDE, Editor

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Technical World Magazine

FOR DECEMBER

The Dollars and Cents of Homesteading

¶ Under this title in the December Technical World Magazine Charlton Lawrence Edholm tells what the homesteader actually has to face when he undertakes to farm government reclaimed land, how much capital he must have and what are his obstacles and discouragements, financial and moral. The story is one that has not been paralleled in print and every man or woman who contemplates homesteading should read it. It will help make many successes and save many bitter failures if its information is taken to heart.

What Latin-America Thinks of Us

¶ The Latin-Americans hate us. Ralph Waldo Emerson who has travelled among our southern neighbors and made a study of their attitude towards the United States and its people has found some strange conditions and tells them in a most interesting and enlightening manner. His story is a revelation to Americans who have been accustomed to believe that Uncle Sam is looked upon, in the western hemisphere as a benevolent protector of everybody. The hostility, dislike and contempt with which "the little brown brother" looks upon us is amazing and would be amusing but for certain serious aspects.

The Great Gift of Work

¶ Henry M Hyde chooses this as the title of a clever satire which carries its own point in its own way to all thinking Americans. Comparatively few of us look upon work as a privilege and Mr. Hyde's odd angle of view in this particular instance will put some things in a new light. It is the sort of thing that doesn't bear description but makes a vivid unforgetable impression.

Why Postage is High

¶ This is a question much discussed of late and one side of it about which little is known is held up to view by Worth C. Harder. He tells how the franking privilege given to members of Congress has been and is being abused privately and politically to the cost of the whole people. The array of reasons why this privilege should be done away is convincing enough. Incidentally the story is very entertaining.

The Technical World Magazine

contains these and twenty other articles of absorbing interest which not only should be read but which no well informed person can afford not to read. Each tells a story of some important phase of life that intimately and vitally concerns every one of us.

Don't Miss This Number **On Every News Stand Nov. 17th**

F. STEARNS
NOVEMBER

A MOMENT'S REST.
Steel worker in a Pittsburgh mill.

THE TECHNICAL WORLD MAGAZINE

VOL. XIV NOVEMBER, 1910 NO. 3

SEVEN-DAY SLAVES OF STEEL

By

P. HARVEY MIDDLETON

ON a Sunday in 1906 a remark, apparently trivial at the time, gave birth to one of the most important reform movements in the history of these United States. It was made at the Walton Methodist Episcopal Church, in 24th St., Pittsburgh. The pastor, the Rev. George W. Grannis, had been impressed with the fact that very few men in the City of Steel attended church service.

"Why don't more of you fellows come to church?" he asked a burly Bethlehem roller.

"Huh, precious little chance we have of going to church or anywhere else on Sunday. You stop this infernal Sunday work, then perhaps we may come to church."

"Well," said Pastor Grannis, "I will see what I can do."

A petition was drawn up to all employers of labor, being endorsed by the majority of the churches, thirty-eight labor organizations, and the Pittsburgh Chamber of Commerce. The employers were told plainly that Sunday work did not pay, and that no good would come of it in the long run. Several prominent steel companies quietly made an investigation of which the public heard very little indeed. After a lapse of two or three years the United States Steel Corporation said they were satisfied that Sunday work was bad from every point of view, and in an order directing the abolition of Sunday labor to the largest possible extent at the plants of the various subsidiary companies, Judge Gary said: "Mr. Corey, Mr. Dickson and I have lately given much serious thought to the subject of Sunday or seventh day labor. . . . I emphasize the fact that there should be at least twenty-four continuous hours interval during each week in the production of ingots." The writer happened to be in Homestead, Pennsylvania, one Sunday morning in July and on the car to Pittsburgh sat down with a workman from the Carnegie mills, who was covered from head to foot with the oil and grime of the shop. He was asked if there had been any reduction of Sunday work since the order had been issued.

"Reduction be ——" he ejaculated, explosively. "Why, I haven't had a Sunday off in two years." Then he suddenly became very serious and looked fearfully around the car. The steel workers have learned by bitter experience that the spir-

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of the corporation are everywhere), bent down—he was over six feet—and whispered in my ear, "This morning I skipped without saying a word to the boss. I don't know what'll happen, and I have a wife and five kids at home. But I think I might have at least one half-Sunday in five years, don't you?"—This last an almost pathetic appeal.

Here was an American citizen who had been working twelve hours a day, seven days (eighty-four hours) a week for five consecutive years. He was a laborer in the blast furnace, and the Steel Trust paid him, for his endless toil, sixteen and a half cents an hour. He wanted to spend the rest of that Sunday with his wife and children, but there was very little doubt in my mind that when he returned to work on Monday morning he would be promptly discharged for quitting work, without permission, on the "day of rest."

In the latter part of January, 1910, a machinist in shop No. 4 of the Bethlehem Steel Company (the great rival of the Steel Trust) at South Bethlehem, Pennsylvania, remained away from his job on Saturday in order to avoid the possibility of being ordered to work on the following Sunday. He was not, mind you, a seven-day man, but one who formerly worked ten hours and twenty-five minutes from Monday to Friday, and five hours and twenty minutes on Saturday. But he, in common with other workmen of that shop, had been frequently made to work over-time and Sundays, and it was feared that these encroachments might ultimately result in the longest hours; i. e., twelve hours, seven days a week, being made the uniform ones for the entire plant.

When the machinist referred to, whom we will call Smith, returned to work on Monday, he told his comrades of his reason for staying away. The foreman heard of it and he was immediately discharged. His fellow workmen talked the matter over and decided to ask for

AT THE OPEN HEARTH.
Men labor here in intense heat.

IN THE GLARE OF THE CONVERTER.
Note the haggard expression of the face.

Smith's reinstatement, and to make this request the occasion of an additional demand that Sunday work be eliminated and over-time reduced to a minimum in the machine shops. They selected three machinists to act as a committee to the foreman. Those three machinists went the way of Smith. To cut a long story short, the men in Machine Shop No. 4, bitterly resenting the discharge of their representatives, went on strike, and were quickly joined by the men of two other shops.

The strike which ensued as a consequence of these three machinists daring to protest, in behalf of their fellows, against Sunday labor, was one of the most notable struggles in the industrial history of this country. It not only raised issues concerning directly the nine thousand men employed in the Bethlehem Steel Works, but brought to the attention

ILLUMINATION FROM WHITE HOT METAL.

of the American public certain industrial problems which can not be settled by capital and labor alone. The American people must assume a distinct share in the responsibility of their solution.

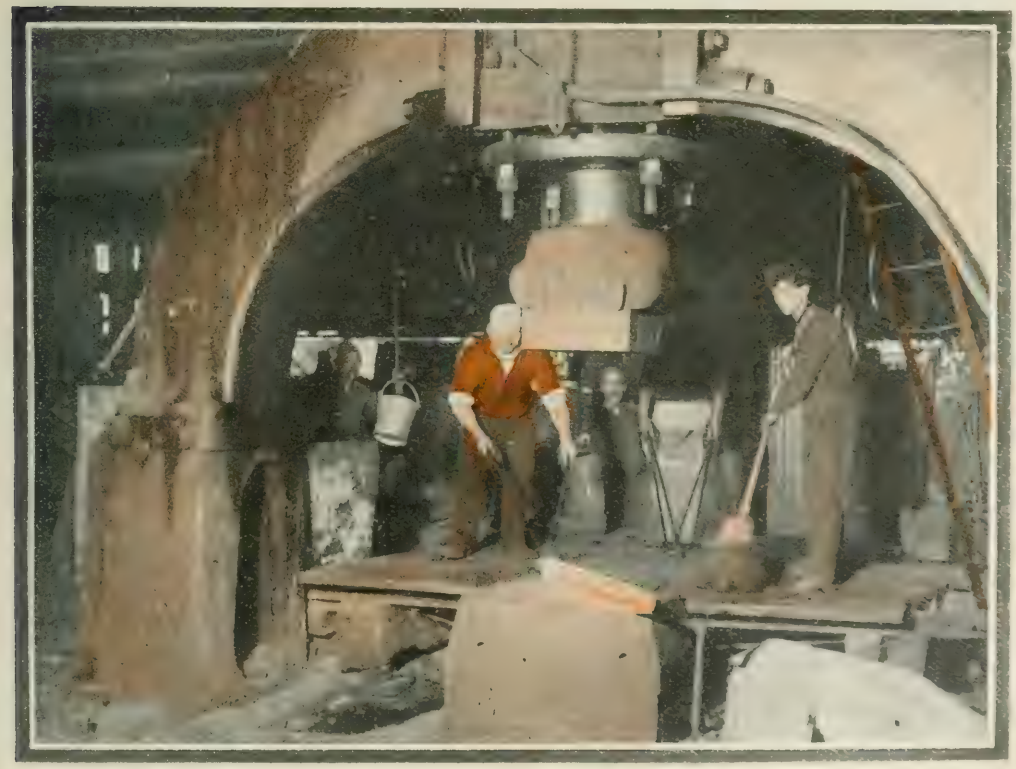
It should be distinctly understood that organized labor had nothing to do with the strike, for aside from a small carpenters' union, and a few organized bartenders, there were no trade unionists in South Bethlehem. The Amalgamated Association of Iron, Steel and Tin Workers, to which most of the men would naturally belong, had been systematically forced out of the works since the strike in 1883. The strike leader, knowing the feelings entertained by the officials of the Company against trade unionism, deliberately kept the subject of organization in abeyance, thinking the matter would be settled. But one of the trades, after a few days, sent for the organizer of their union, who, in his turn, notified the Federation of Labor in regard to the situation, and a number of national organizers were sent to South Bethlehem. As a result of their efforts during the period of enforced idleness, practically

every trade in South Bethlehem is now organized.

After seven weeks of bitter resistance, the strike at Bethlehem went to pieces, and most of the men returned to their shops, the Company announcing that Sunday work would be optional in the future. It is, nevertheless, a fact that foremen and gang bosses, colloquially known as "pushers," are compelling men to work on Sunday, against their protest, upon pain of discharge. The question is, therefore, where it was at the beginning of the year, and so let us inspect the payroll as it appeared in January, 1910, just before the strike. We find that large numbers of laborers were working for twelve and a half cents an hour, twelve hours a day, seven days in the week. Of the 9,184 employed in January, 2,640 were working for twelve, and under fourteen, cents an hour, 1,528 for fourteen, and under sixteen, cents an hour. Of the 2,628 regular seven-day workers, seventy-nine were working thirteen hours and ten minutes per day or night; 2,322 twelve hours per day or night, and 212 ten hours and twenty-five minutes. The rates paid for over-time work and Sunday work alike did not differ by one cent from the ordinary hourly rates.

The departments operating continuously one hundred and sixty-eight hours a week with two crews, thus working seven days of twelve hours and more each week, as reported by the officials of the Company, were: open hearth, blast furnace, boiler shop, soaking pits, forty-inch blooming and rail mills, gray mills, mechanical departments and general labor. In addition to these a part of the electrical departments in both divisions of the works, Lehigh and Saucon, and a part of the office force at Saucon, worked seven days of twelve hours each.

Over forty-eight per cent of these seven-day toilers were paid less than sixteen cents an hour, thirty-one per cent less than fourteen cents, and sixty-one per cent less than eighteen cents.



FORGING AN INGOT OF STEEL WITH THE HAMMER

Try and imagine, if you can, what it means for a human being to work twelve hours a day, seven days a week, in the intense heat of the open hearth department during the summer months, in an atmosphere heated by radiations from rows of immense furnaces, each containing from thirty to sixty tons of boiling metal; or in the blooming mills where huge ingots weighing ten tons each are brought to the rolls white to the core, and throwing out a vicious circle of withering heat. Such a condition of existence is inconceivable even to a constant visitor at the mill. In the summer time it is concentrated hell, and in the winter when the laborers must step from the furnace-like atmosphere of the mill to the icy outdoors, it is very little better. Is it any wonder that a man is gray at thirty-five, or that frequently a steel worker is laid off indefinitely with shattered nerves?

Now let us see what this seven-day labor means to the employers. An inspection of the accountants' report of the Bethlehem Steel Company shows a capital stock of $13,500,000. The corporation paid out in wages in 1909 $4,876,742. The average number of employes for the year was 6,707. The gross manufacturing earnings were $2,494,598, which you will find is equivalent to a profit of three hundred and seventy-one dollars and some cents a year for the work of each man on the payroll, and a profit of fifty-one cents for each dollar paid in wages. Put it another way and we find that the Bethlehem Steel Company earns $1.15 every day of the 365 in the year on the labor of every man in its employ.

Following the revelation of conditions at Bethlehem, President Charles M. Schwab protested that the conditions in his plant were not exceptional, but were general throughout the steel trade. He thus called attention to the extent to

POURING THE LIQUID STEEL AT THE OPEN HEARTH.
A dangerous and exhausting job.

WHERE MEN WORK THEIR LIVES AWAY.
A Pittsburgh steel plant.

which over-work and over-strain has become the common order in the steel plants of America. It is a fact that there are eight thousand eight hundred seven-day men in blast furnaces and sixteen hundred and fifty in the open hearth furnaces of Allegheny County, a total of ten thousand four hundred and fifty men, or about fourteen per cent of the mill workers of the county.

On May 27th last, W. B. Dickson, First Vice-President of the United States Steel Corporation, at the annual meeting of the American Iron and Steel Institute, came out openly and vigorously for a six-day working schedule. "It is my own deliberate judgment," said he, "after a period of almost thirty years' continuous connection with the industry, the early part of which was passed in manual labor in the mills, that the present conditions, which necessitate the employment of the same individual workman twelve hours a day for seven days a week, are a reproach to our great industry, and should not in this enlightened age be longer tolerated."

There are of course metallurgic reasons for continuous operation in certain processes, entirely aside from economic or commercial incentive. Physical and industrial necessity requires seven days' work of twenty-four hours each per week in the production of pig-iron and liquid iron metal from the ores. In the case of admittedly continuous processes there is but one remedy for long hours, and that is the three-shift method of labor. This method can also minimize Sunday work by such rotation that each crew would have two Sundays out of three.

This problem of continuous operation seven days a week is of course not confined to the steel industries. It is found with more or less variations in such industries as the steam railroad, street railway, telephone, telegraph, paper, mining, smelter, and glass. A few years ago the American Sabbath Union was re-organized into the Lord's Day Alliance, and the newly organized society, attracted by the work of Doctor Grannis, asked him to take charge of a great national movement for the elimination of seven-day work.

Massachusetts and Maine are the only states which at present provide by law

STRIPPED TO THE WAIST, THE WORKERS SWEAT BEFORE THE BLAST FURNACE.

that every workman shall have one free day in seven, thus effectively supplementing the old Sunday laws in those industries where operations are necessarily continuous. On May 19, 1910, however, there was introduced into the New York Senate a bill calling for fifty-two rest days of twenty-four hours each within the year for all employes, at least seventeen of these rest days to be on the Sabbath. Owing to the fact that the bill was introduced late in the year it was not passed, but will be brought up again at the next meeting of the senate.

As it is proposed to make this bill the model for similar bills to be introduced in all other states where seven-day labor exists, the following extract from it is given:

"All labor on Sunday is prohibited, excepting the works of necessity and charity. In works of necessity or charity is included whatever is needful during the day for the good order, health or comfort of the community.

"In the case of Sunday labor, permitted on the ground of being works of necessity or charity, or by special statute, it shall not be lawful, except in cases of extraordinary emergency caused by fire, flood, or danger to life or property, for any person, partnership, association or corporation to require or permit any person under their authority to do, on Sunday, the usual work of his occupation, unless such an employe has been allowed, during the six days next preceding such Sunday, twenty-four consecutive hours without labor, nor unless during the preceding nine weeks, three of his rest days shall have been on Sunday. Provided, however, that in case any person shall have filed with the county clerk of the county in which he labors an affidavit stating that he has conscientious scruples which lead him to prefer to keep any day other than Sunday as a holy day and free from labor, it shall not be lawful to employ him on Sunday, unless, during the preceding nine weeks, three

of his rest days shall have been on that day of the week which he shall have stated in the said affidavit that he prefers to Sunday as his rest day. These rest days must be allowed to be spent where the employe resides and may not be abridged either at the time of ceasing or of resuming work, and no waiver of the use of the rest day on the part of any employe may be accepted. This section shall not be construed as authorizing any work on the first day of the week not now authorized by law, nor as applying to farm or household service, to watchmen, to janitors or superintendents, or to managers. This section shall not apply to all the departments of the town, city, state or other civil government within this state, except the police department. It shall be the duty of all officers and directors of every railroad and street railway corporation owning or operating a line or lines, either wholly or partly within the state, and of all telegraph and telephone companies and of all persons, partnerships, associations and corporations employing Sunday labor within this state to prescribe and enforce suitable regulations for the carrying out of the provisions of this act. Any person violating any provision of this section shall be guilty of a disdemeanor."

TOO WORN AFTER LABOR TO DO AUGHT BUT REST.
One of Pittsburgh's steel mill slaves.

RUNNING A FIVE HUNDRED POUND LUMP OF WHITE HOT METAL ON AN OVERHEAD TROLLEY FROM FURNACE TO HAMMER.
Two men are riding; one pushing.

In April, 1909, Doctor Grannis started a vigorous compaign for the lessening of the work of postal employes on Sunday. The National Associations of Postal Clerks and Letter Carriers, representing twenty-five thousand constituents, gave their hearty support to the movement. No appeal was made to close the post offices on Sunday, it being conceded that much work is necessary on that day, but the authorities were asked to give these useful servants of the public sufficient rest time in the week to compensate them for Sunday labor. As a result a bill was introduced in Congress last session granting compensatory rest time to all postal employes. Another interesting result of the rest day movement has been the order of the Navy Department directing commanders to inspect their vessels on week days rather than on Sundays, as has been the custom heretofore.

Some idea of the magnitude of this warfare for one day's rest in seven may be gathered when it is mentioned that in the City of New York employes are compelled to work seven days in the week in 3,726 restaurants, 290 hotels, 1,905 drug stores, 712 florist shops, 2,550 cigar stores and stands, 1,600 news stands, 2,000 delicatessen stores, 1,726 candy stores, 2,500 bakeries, 100 automobile garages, and 1,037 livery stables, aggregating three hundred thousand employes in this one city who are deprived of their "day of rest."

Nor is this by any means all. The various transit companies in New York City carry about four million passengers a day on the subway, surface and "L" lines. The men in charge of this multitude of travelers work seven days a week, a twelve or fourteen, often a sixteen hour day. Did you ever sit in front of a trolley-car where you could see down the track ahead and notice the chances people take in crossing the street? Weren't you glad that you were not the motorman? Think of the nervous strain he is under in guiding his car through the crowded city streets with the lives of passengers and pedestrians to safeguard. Is it any wonder, when these men are not allowed more than two days' rest a month, and very often not that, that a man is killed by a street car every twenty-four hours in Manhattan alone? The general adoption of one's rest day in seven would do much to reduce, in this country, the mortality from accidents

which is proportionately greater than that of any other nation on earth. Every year we kill and maim some half a million human beings because our employers of labor, in their near-sightedness, think it cheaper to take chances than to protect their workmen by granting adequate rest time for body and mind.

Yielding to the demand of various organizations, the United States Steel Corporation has within a few weeks stopped the running of all Sunday trains carrying material for their mills, thus relieving thirty thousand men of their accustomed Sunday work. All mills of the Carnegie Steel Company and the National Tube Company at Pittsburgh, the International Paper Company at Franklin, New Hampshire, and many other industrial establishments of the country, have also stopped Sunday work. In Pennsylvania a new million dollar trolley line was given the free right of way to run from Newcastle to Sharon on the agreed condition that no cars should be run on Sunday.

Washington, D. C., is making a vigorous crusade against Sunday moving picture shows, and Wisconsin has passed a bill closing the barber-shops on Sunday.

Alois B. Koukal, Secretary of the Slavonic Immigrant Society, tells the story of John Kroupa, a Bohemian who has been here twenty-two years. Faithful, strong, willing, he got a job as watchman on a Pennsylvania Railroad crossing at Woods Run, and there he worked for sixteen years, his wages forty dollars a month for a twelve-hour day and a seven day week (in the last two years, forty-four dollars). All this while he hoped for promotion, but it didn't come, and this non-recognition rankled within him.

"Other men, who were all sore from sitting down so much, were promoted!" exclaimed he, "but I, who was always hustling, was never thought of, and I can tell you it wasn't an easy job to watch that no accident happened, as more than three hundred trains passed that way every day, and very often at full speed, disregarding the city ordinances, —thirty or forty miles an hour."

Three years ago the crossing was abolished, the tracks having been elevated. The superintendent came to him at that time. "Well, John, I am sorry for you: you're going to lose your happy home." This was too much for John, and his long-pent up disappointment burst out. "Go to hell!" said he. "A happy home! I could just as well have been in the penitentiary over there; I would have been much better off; without the responsibility and worry I have here. During sixteen years I didn't have a single day off. Sundays and week days both I have been here for twelve hours. Do you call that a happy home?"

A FRESH TRAIL TO SANTA FE

By

HARRY F. KOHR

IT is 106 years now since one La Lande, an adventurer for a St. Louis fur trader, drove away from the banks of the Mississippi toward the setting sun with the ancient City of the Holy Faith as his goal. It was he who blazed across the trackless prairies that wonderful highway that lives in history, romance and adventure as the Santa Fe Trail.

Without so much as a map to guide him, La Lande laid out one of the finest natural roads the world has ever known, over which, until the railroads came and built beside it, flowed the commerce of half a continent. After him followed the sturdy pioneers, who pushed across the plains and into the foothills of the Rockies the thin wedge of civilization that split asunder the myth of the Great American Desert and made the Great Plains the wheat belt of the Union.

The story of the Santa Fe Trail is the story of the West—that vast, mysterious West of history and of fiction, that wide and breezy West of today; that West of wagon trains and Indian raids, of buffaloes and sod houses, of cattle trails and cowboys; that West of broad fields and country mansions, of motor cars and memories.

There still live in the West men who knew the old Santa Fe Trail in the days of its glory when mile-long wagon trains dragged slowly over hill and plain. The prairie schooner of that day has given way to the motor car of this, the bull whacker has become a chauffeur, and the old trail has become the new — the New Santa Fe Trail,—a motor speedway from the bank of the Father of Waters to the Plaza of Santa Fe. Over the old trail these pioneers and their sons are spreading a boulevard one thousand five hundred miles long.

It is not merely a project, this New Santa Fe Trail. It is a solid actuality, which four states are pushing to completion, with Kansas and Colorado well in advance. The "whereas" and "be it resolved" stage has long been passed and the oratory has given way to the crunch of the steam grader. The New Santa Fe Trail is practically finished between Hutchinson, Kansas, and Canyon City, Colorado, at which latter place one branch ends. It is being pushed south from La Junta to Santa Fe and east from Hutchinson to Kansas City and St. Louis.

Founded in sentiment, the real incentive behind the New Santa Fe Trail was the big red touring car. Times change and men with them. So long as the old "double rig" was good enough—even a mark of wealth—for the western Kansas farmer, he took little interest in good roads. Then along came alfalfa and the days of dollar wheat and regular crops and with them the motor car. It was a change in the times and the farmer changed with them. With his mortgages paid off, a fine, big mansion where his old sod house had once stood, money in the bank and his sons and daughters getting college educations, the farmer began to look at things differently

The Route of the New Trail to Santa Fe

His "double rig" was discarded for the motor car, and the virtues of good roads began to become real instead of academic. He even insisted upon having them.

What the preaching of twenty years had failed to accomplish, the motor car accomplished in one

THE OLD AND THE NEW ON THE SANTA FE TRAIL WEST OF GARDEN CITY, KANSAS.

THE FAMOUS SKYLINE DRIVE NEAR CANYON CITY, COLORADO.

ONE REASON WHY THE OLD TRAIL IS BEING REFORMED. A bit of quagmire on an eastern Kansas road.

—the conversion of the Kansas farmer to good roads. In the western part of the state at the last count every third family owned a motor car. At the rate they have been buying them since it is probable that a car to every other family would be nearer the right figure. Every town has its motor club and garages have supplanted the livery stable. The farmers have their sociability runs with the townspeople and very frequently the merchants in the trading towns go out on extensive business tours, visiting the smaller places within a radius of fifty miles or so. With motor cars in such common use, good roads were not only desirable but a necessity.

The idea of a new Santa Fe Trail originated with C. H. Scott, editor of the Hutchinson *News*. He took a motor drive through the country around Garden City and, struck with the excellence of the roads that had been built through the sand hills there, outlined his idea for a good road along the old Santa Fe Trail from Hutchinson to Pueblo. He made a plan of campaign with R. H. Faxon, editor of the Garden City *Telegram*, for carrying out the idea. They called their project the Arkansas Valley Speedway.

The idea was taken up with enthusiasm

VIEW OF CANYON CITY FROM SKYLINE DRIVE OF THE NEW SANTA FE TRAIL.

and in a few months the road practically was completed from Garden City to the Colorado state line. Colorado took up the Speedway with enthusiasm and the counties along the old trail pushed the new road through to Pueblo. There it was connected with the fine road that led westward up the valley of the Arkansas River to Canyon City, ending at the Skyline drive, one of the most magnificent mountain roads in the world, skirting the edge of the Royal Gorge, through which the river flows a thousand feet below.

From Editor Scott's end the work took a little longer, the agitation for the Speedway finally resulting in a big conference at Hutchinson, January 31, last. There a regular organization was formed with Mr. Scott as president and Mr. Faxon as secretary. The name of the road was changed to the New Santa Fe Trail. A vice-president was appointed for each county through which the road passed and subordinate organizations to do the local work were formed in each county. The state engineer was called into the conference, and plans were made for carrying the new trail through from Hutchinson to Garden City. Work was begun almost immediately on several stretches of the road and by spring the whole length of it was completed.

In some places the old Santa Fe Trail had been abandoned for newer roads. Connections were built between these new roads; concrete bridges were put in wherever new bridges were necessary; concrete culverts replaced old wooden troughs which carried drain water across the roads, and, wherever mileage could be saved, cut-off roads were built.

At frequent intervals in that part of Kansas patches of sand are encountered along the roads. These sand patches form an excellent road in rainy weather but in dry weather they are almost impassable. The government formula was used in treating these patches of sand. They were first graded over and then covered with a thick layer of gumbo, clay or gypsum, whichever was most convenient. This covering was then plowed into the sand and the road rounded up again and rolled with a high crown in the center. This sand mixture makes a natural road which cannot be excelled anywhere.

The gumbo clay or gypsum—the latter being considered the best—forms a natural binder which sheds water like a

duck's back. After the patching was done and the bridges built, the whole length of the road was rounded up with King road drags until it was crowned and solid. Nearly every farmer along the way contributed time to the work and lent a team or two and when the cost was figured up it was found that it had cost the counties less than fifty dollars a mile. For that insignificant amount was built a natural speedway from Hutchinson west to the Colorado line, thirty feet wide and as smooth and springy as a wooden block pavement and made of nothing but common dirt.

When the work was completed, an endurance run was made by ten motor cars from Hutchinson to Pueblo, 461 miles, and the road was in such fine condition that every car went into each station ahead of time on a schedule that called for twenty miles an hour of continuous running. The new road has become the favorite motor tourist route to Colorado, and the New Santa Fe Trail association has had so many demands for information about it that it has been found necessary to put out a temporary route book to meet the demand, pending the publication of a complete log and map. Since the first endurance run, there have been several other long runs over the road and hundreds of short sociability tours. Between Garden City and Pueblo the road traverses the famous irrigated section of the Arkansas Valley, the land of the Rocky Ford cantaloupe and the sugar beet, where broad areas of alfalfa and wheat and broom corn and miles of young and thriving orchards fringing the highway delight the eye.

Originally there were two lines of the Santa Fe Trail from Hutchinson to Kinsley, Kansas, one of which followed the great bend of the Arkansas River, the other making a short cut across the bend. The original lines of the Arkansas Valley Speedway followed the cut-off. But the people along the old bend road didn't purpose to be left out of a good thing so they built another line of the speedway the equal of the original.

The road had a practical side to it as an investment, and great possibilities; but neither Scott nor Faxon realized the full possibilities of the project they had

THROUGH RATON PASS IN THE RATON MOUNTAINS, COLORADO.

set going. Neither did any of the others. To them it was more or less of a local project, never expected to go beyond Hutchinson on one end and the Royal Gorge on the other. But the primrose on the brim of the Arkansas was something more than a primrose to the towns east of Hutchinson which lay along the old Santa Fe Trail. If it was to be a New Santa Fe Trail why didn't it take in the whole length of the old trail? Was there any reason why the new trail shouldn't follow the old trail to this, that, or the next town. There wasn't. So the towns east of Hutchinson joined in a convention a few weeks ago at Emporia and it was decided to swallow the whole morsel and build the new trail on to Kansas City.

"But," said Kansas City, "you have overlooked the fact that the real beginning of the old Santa Fe Trail was down at Old Franklin, long before the steamboats began to unload their cargoes at the mouth of the Kaw, and if you are willing to stretch a point you can even say it started at St. Louis, because there La Lande began his historic journey over the old Boon's Lick Road to Old Franklin. Besides, Missouri has already planned a fine cross state highway over that route between St. Louis and Kansas City."

There being no objection, Kansas City

A DIFFERENT KIND OF TRAIL TO SANTA FE.
Royal Gorge in the Grand Canyon.

WHERE THE WALLS OF THE GRAND CANYON TOWER OVER 2,600 FEET ABOVE THE RAILROAD TRACK.

just hooked up both ends and planned what will be, within a few years, the longest continuous road on the American continent, a country boulevard that will be the pride of the Middle West, a scenic panorama of great rivers and vast forests, of majestic, verdure clad bluffs, of bustling cities and waving fields, wide prairies and towering mountains, fifteen hundred miles of almost every variety of landscape to be found in these broad United States.

Several years ago the Missouri General Assembly passed a bill creating a state road fund and providing for a cross-state highway from St. Louis to Kansas

LOOKING DOWN—NEARLY HALF A MILE—INTO THE ROYAL GORGE.

City, to be paid for, in part, out of that fund. It provided that the state should join with the counties through which the road would pass in sharing the cost. After considering several routes, it was decided to build the new highway along the old Boon's Lick Road to Old Franklin and from there along the ancient beginning of the Santa Fe Trail to Kansas City. The Old Boon's Lick Road struck North along the Mississippi and then across the Columbia Bottoms toward St. Charles where it crossed to the north side of the Missouri River and cut across the south bend of that stream to Old Franklin, then the head of steamboat navigation on the Missouri. From Old Franklin until the thirties the caravans

set out for Santa Fe, following the Missouri River west to Arrow Rock, where the trail crossed to the south side and made west to Westport Landing and Independence. When the steamboats pushed up to the mouth of the Kaw, Independence and Westport became the eastern end of the trail.

Missouri laws require that the county dramshop license fees go into the road fund, and under that provision the more populous counties have built many fine macadam roads. Thus, many miles of macadam highway have already been built along the old Boon's Lick Road and the old Santa Fe Trail in Missouri, so that not more than half the total mileage of the cross state road and the connecting roads will need to be paved. The proceedings on several stretches of this road have been begun, whereby the cost will be apportioned between the state, the county and a road benefit district.

With the connecting link in Kansas between that portion of the New Santa Fe Trail already completed and the Missouri State Highway, the situation is somewhat different. Only those who have attempted eastern Kansas mud roads in rainy weather can do them justice. Execrable is a mild term. West of a line dividing the state in exact halves where the rainfall diminishes good roads mean merely better cared for natural dirt roads. Paving is not needed there and a few drags a year with a King drag will make an excellent highway of any road. East of that line, however, the rains are more frequent and the nature of the soil requires that a road be macadamized to be really good and passable at all times.

Kansas, usually well in front in everything else, has been away behind in good roads building where good roads are needed. In the eastern part of the state there are only a few miles of macadam roads close to the larger cities. In fact, it is only within two years that Kansas has had a road law worthy the name. Under that law, property owners may join in creating a road benefit district to build roads to be paid for by an acre tax. Under that law preliminary proceedings have been begun on several long stretches of the line of the New Santa Fe Trail between Hutchinson and Kansas City. Despite the heavier cost to the land owner in Kansas, better progress is being made on the New Santa Fe Trail in Kansas than on the Missouri State Highway in Missouri. But, good roads movements gain momentum as they go, and, if Missouri does its part, it won't be three years until the New Santa Fe Trail is complete from end to end.

Colorado and New Mexico are doing their part on the road south from La Junta, which is still a main traveled road for the greater part of its distance. Denver, too, proposes to better an already fine road from that city to Pueblo, which will make a Front Range Speedway between the two cities. Several other laterals have been projected, some fanciful, some likely to be carried out. Certain it is that the new trail has given a great impetus to the movement for better roads in the Middle West.

Just now the New Santa Fe Trail is the biggest undertaking of that kind in that part of the country. And as it grows, the view grows with it. From

One of the Monuments That Patriotic Citizens Have Erected, Along the Trail, to the Spirit of a Former Age

New Mexico one looks toward the Pacific, from the banks of the Mississippi one looks toward the Atlantic. And, why not? There is the old National Pike that loses itself somewhere in Indiana or Illinois. "Why," Kansas and Missouri and Colorado and New Mexico are asking, "why don't the people on the other side of the Mississippi wake up and hitch their old pike onto the New Santa Fe Trail and run it back to Philadelphia, or New York or Boston, while we shove the other end out to the Pacific?"

In Kansas City the Old Trail Has Become a Parked Road.

This feat would be in the interest of history as well as of utility. Along the old Cumberland Pike poured westward the multitudes of pioneers who conquered and made the farther western country. But to think of this road, one gets a vision of lanky backwoodsmen clad in suits of buckskin and squirrel skin caps, long rifle in hand, marching along long after the days of that hardy band under General Harrison at Tippecanoe. This road, running one-third the way across the continent, is indeed well worthy to be linked up with the Trail of the Santa Fe to form the greatest possible monument to pioneers and pioneer days.

As a matter of fact, the states east of the Mississippi are really alive to the situation, and Federal aid is being sought to put through this project. The December issue of The Technical World Magazine will contain a finely illustrated article covering the story of the Cumberland Trail.

Bedouin Love Song

MY steps are nightly driven,
By the fever in my breast,
To hear from thy lattice breathed
The word that shall give me rest.
Open the door of thy heart,
And open thy chamber door,
And my kisses shall teach thy lips
The love that shall fade no more.
Till the sun grows cold,
And the stars are old,
And the leaves of the Judgment Book unfold.

—Bayard Taylor.

NEW STAMPEDE FOR GOLD

By

FRANK C. DOIG

THE rush to Iditarod is on. It is another Klondike, with a more or less visionary fortune within the grasp of every itching palm. Far up under the shadow of the Arctic Circle, in the interior of the Alaskan wilds, man has discovered gold, piled in untouched heaps.

Iditarod! The word has echoed across the American continent and its magic sound even has been heard in foreign lands. This strange, aboriginal sound with its promise of yellow gold is luring men from every walk of life. The grizzled veterans of many a stampede are harkening to its siren cry. Clerks, mechanics, business men are dropping their labors to rush to the new land of promise. Farmers are leaving their plows and the men who are down and out are taking hope. Thousands believe the creeks of Iditarod are dyked with gold dust and each man wants his share.

Seattle, the gateway to the Alaska treasures, is feeling the strains of this madness. Steamship accommodations to the north are unobtainable. Men with money are bidding for places in the steerage. Freight is piled high on the wharves. All the complicated, thrilling

ENORMOUS CROWDS GATHER AT SEATTLE WHENEVER A STEAMER IS ABOUT TO SAIL FOR THE IDITAROD GOLD DISTRICT.

ST. MICHAEL'S, ALASKA, WHERE THE PASSENGERS FOR IDITAROD LEAVE THE SEATTLE BOATS AND TAKE RIVER CRAFT UP THE YUKON.

incidents connected with a gold rush are in full swing.

Word comes from the mysterious district that the gold runs from $5 to $50 to the pan. Five creeks have been discovered, on each of which the pay dirt is said to extend seven miles. Enough for all comers in this thirty-five miles of gravel and sand! And surely, reasons the stampeder, there will be more discoveries and fortune will smile on those who brave the dangers and hardships of the northern trip. Millions were made in the Klondike, on the Nome beaches and the Fairbanks creeks, why not in the Iditarod? Scores of lucky argonauts went

ANGORA GOATS PRESSED INTO SERVICE IN THE STAMPEDE FOR GOLD.

WRESTING GOLD DUST FROM THE SANDS.

PLACER MINING ON ONE OF THE CREEKS OF IDITAROD.

THE STAMPEDE FROM SEATTLE FOR IDITAROD.

north ten years ago and made their "piles." Now they multiply their "piles" by thousands and even millions. And Iditarod will be the same.

There is never a word of the hundreds who rushed to the icy north and found no gold. Those who came back penniless and in debt, broken in health and those who never came back at all. These are not considered in this mad rush for the new diggings. Men who never had a blister on their white hands talk easily of breaking trails and "mushing" over the mountains. Men who never knew what hunger is, have no fear of starvation. Men who wouldn't know pay dirt if it were shown to them, will sacrifice everything to reach the district where the gold lies in piles. All this is characteristic of the greed panic.

Some stampeder whispers he is going to start a bank in the Iditarod district. Immediately the bank is in existence and doing an enormous business. Every dreamer can picture himself dumping his pokes of yellow dust into the vaults of the institution. Another rumor starts that a magnificent hotel will be erected at once. The visionary tenderfoot immediately finds himself comfortably settled in a hostelry that would do credit to one on Broadway.

The Iditarod district is reached by boat from Seattle. At St. Michaels, at the

mouth of the Yukon River, the gold seeker leaves the ocean liner and boards a river boat. He goes up the river to the nearest point to the district and then the "mush" overland begins. Everything in the way of transportation facilities is being pressed into service. Even angora goats are used to haul the sleds over the snow-covered ground. Dog teams are in big demand. But hundreds must travel on foot or take small boats and paddle up the creeks.

There are no accommodations for comfort. Everything is in the rough, rougher in fact, than anywhere else in the world. The country is wild and rugged. Railroads have not penetrated the fastnesses. Even roads are unknown and only trails lead to the creeks from which the gold must be wrested.

Besides the hundreds of gold seekers from the outside world who are hurrying to the Iditarod, the Alaskans themselves are flocking to the new diggings. It was predicted that summer would see many of the famous camps of Alaska deserted. This has proved true. The celebrated city of Fairbanks is doomed. Every one is leaving for the richer fields. Newspapers are preparing to move their plants from Fairbanks to the Iditarod district.

In fact, one of the greatest stampedes for gold the world has ever seen is ending only with the coming of winter. Every steamship on the Pacific Coast that could be pressed into service carried argonauts to the far north. On June 2 the first boat for St. Michaels left Seattle. Others followed in rapid succession at intervals of one and two days. Some of them were caught in the ice fields off the mouth of the Yukon and compelled to wait several weeks before landings could be made.

The Old Man by the Brook

DOWN to the vale this water steers; how merrily it goes!
'T will murmur on a thousand years, and flow as now it flows:
And here, on this delightful day, I cannot choose but think
How oft, vigorous man, I lay beside this fountain's brink.
My eyes are filled with childish tears, my heart is idly stirred,
For the same sound is in my ears that in those days I heard.

—WORDSWORTH

The WORLD'S PRIZE COW

BY HARRY F. KOHR

SOME cows may give better milk, but no cow in the world gives so much of it as Josephine, an eight-year-old Holstein-Fresian, the queen of the herd of the Missouri State College of Agriculture. Just now Josephine is undergoing a test to determine how much milk she will give in a year. Having already broken all the other lacteal records it is a pretty safe bet that Josephine will establish a clear title to the heavy-weight milk producing championship and hold it safe for some time.

Colanthe 4th Johanna, owned in Rosendale, Wisconsin, used to be the prize cow, but Josephine has beaten every one of her records. In the first six months of the present test Josephine produced 16,834 pounds of milk against 15,541 pounds for Colanthe. In one day Josephine produced 110.2 pounds of milk against Colanthe's 106; in one month Josephine produced 2,960 pounds against the Wisconsin cow's 2,783 and she has beaten the Wisconsin cow's averages for two, three, four, five, and six months.

The average farmer is satisfied if his cows give ten quarts of milk a day, but Josephine gives enough to fill fifty-four quart bottles. Giving the average person two-thirds of a pint of milk a day she could supply a hotel with 165 boarders. The butter from her milk would be nough to supply forty boarders three times a day. Naturally with such a high production, the milk given by Josephine is inferior to that given by the average dairy cow, although it meets and exceeds the legal requirements of butter fat. It is estimated that her milk will produce a revenue of $1,200 to $1,500 a year.

And yet with all these honors, Josephine is quite a modest cow. She has hundreds of visitors every week, but fame has not turned head nor switched

her tail. Naturally she has everything that the bovine heart desires, so far as a mere human can understand. When she is not grazing on the broad lawn that surrounds the college of agriculture at Columbia, Missouri, she is kept in a stall—perhaps room would be better—which is furnished as befits her rank as queen. Two or three inches of the softest sawdust cover the floor on which she lies while contentedly chewing her cud. An electric fan in one corner keeps cool breezes flowing over her and netting on the windows keep the flies out.

Every ounce of the thirty gallons or so of water that she drinks every day is warmed to a temperature of seventy degrees, and the dry feed that she gets is the choicest. Josephine rises each morning at 4:30 o'clock for her bath, and at five o'clock she breakfasts on various grains, bran, corn chop, ground oats, linseed meal or cotton seed meal, mixed with beet pulp. She is milked while she eats. At 10:30 o'clock she is given another meal and is milked again, and the process is repeated at 4:30 o'clock in the afternoon and 10 o'clock at night. Between the second and third milkings she is allowed to exercise on the lawn. Never under any circumstances is she allowed to become excited and she is never struck. I. T. Van Note, the college dairyman, her "lady in waiting," he might be called, is the only person who ever touches her.

LAND GIFT TO WILD ANIMALS

By

GUY ELLIOTT MITCHELL

THE white goats, the Rocky Mountain bighorns, the moose, the elk and deer, the giant grizzlies, and all the other wild things of the Northwest have had donated to them another million-acre tract of Uncle Sam's domain. Within its boundaries they may mate, rear their little ones and enjoy life secure from the startling crack of the murderous rifle and the dread thud of the swiftly speeding bullet. And nowhere, perhaps, is there a finer place for these sleek-furred native Americans to work out their several destinies.

This big federal "Zoo" ranges in character from the flat table-land of the Great Plains to inaccessible glaciers and highest mountain peaks, rugged, precipitous, but beloved of the four-footed mountain climbers, while intervening, are meadows knee-deep in rich pasturage, with innumerable lakes and roaring glacial streams, well stocked by nature with brisk trout.

Yet, on the other hand, there are no fences about this park nor other boundaries which the wild creatures may discern, and the deer or bear or wild sheep which venture beyond the unseen line does so at his own risk and, without warning, then becomes the legitimate quarry of the sportsman. Thus the wild territory in the vicinity of the new Glacial National Park in northwestern Montana is destined to become America's most famous hunting ground. The overflow from the park of the game animals of the Northwest will stock the surrounding country for every hunting season of the future.

But again, the disciples of Muir, and

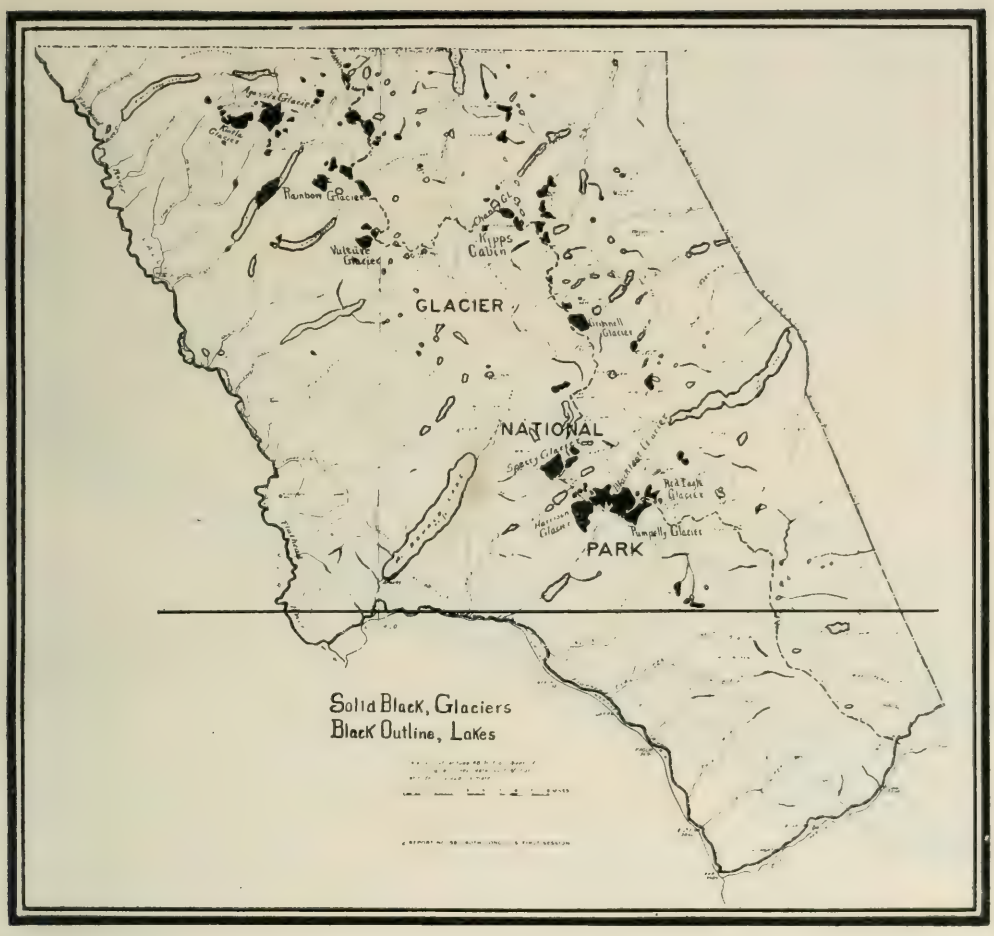
A MOUNTAIN THAT PROVED A HARD CLIMB FOR THE GOVERNMENT EXPLORERS.
Kintla Peak, which rises 5,700 feet above Upper Kintla Lake.

Burroughs and Joaquin Miller, who may enjoy nature and her varied products, animate and inanimate, without desire to kill and despoil, can satisfy their cravings to the full bent in this wonderful region. A dozen years ago John Muir urged the creation of this matchless mountain territory into a federal park and its dedication for all time to the American people and to its wild denizens; for it is suspected that Muir is almost a greater lover of the animals than of the people. But he believes that man, by association with the animals in their native haunts and through close contact with the stupendous natural wonders of the Western country can be much improved and become therefore more like the animals. Give at least a month, he said, to this precious reserve, and the time will not be taken from the sum of your life. Instead of shortening, it will indefinitely lengthen it. Mr. Muir, however, does not draw the line short of fishing, and he tells in a way to electrify the angler, of leaping, speckled trout inhabiting the thousand lakes and streams of the region. Nor has a ban been placed by the government upon fishing in this preserve. You may not carry a rifle into the Glacier Park, but the bamboo rod will not be considered contraband. In all America, probably, there is no place which will afford such sport, such keen

KOOTNA CREEK HEADS AMONG THESE TREES.
With trout, fine pasturage and wood, one may camp here profitably.

or restful pleasure to the naturalist, the mountain-climber, or the tired city worker, according to his several bents, as this Glacier Park. It is wild, unutterably wild, and at present the finest portions are difficult of approach, even inaccessible to all except the most hardy; but the government and the railroads will make it, in the next few years, a real playground of the nation, easy of entrance and traverse to everyone, while carefully preserving all its features of natural beauty. Not that the Glacier Park will ever be overrun by tourists, even after the half million dollars contemplated has been spent in cutting trails

BLACKFOOT GLACIER—THE LARGEST AND FINEST IN GLACIER PARK.

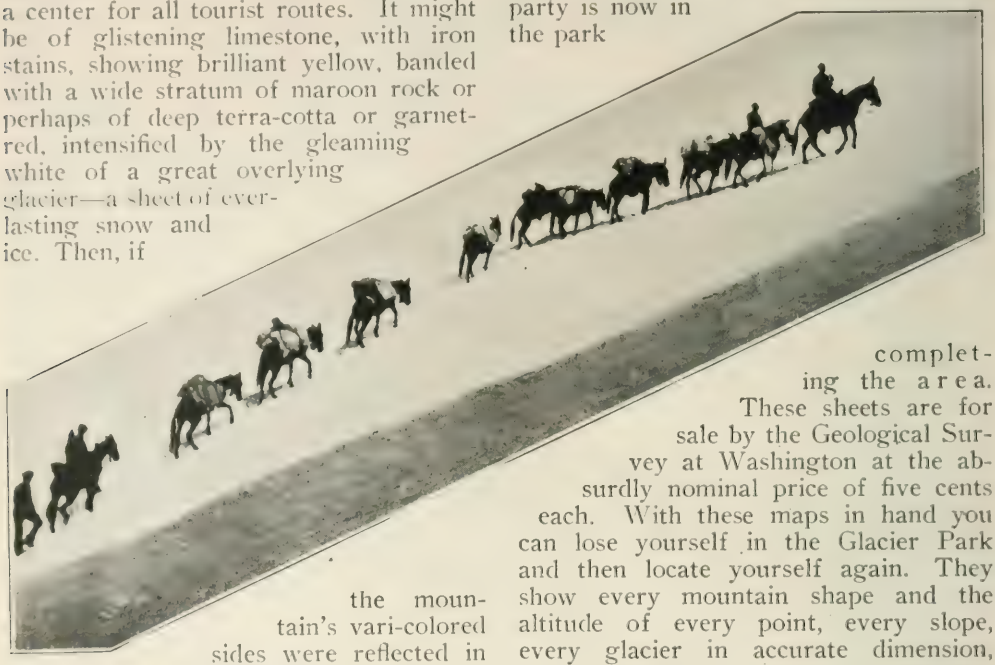


THE NEW NATIONAL GLACIER PARK IN NORTHERN MONTANA.
The region below the black line is, as yet, unsurveyed.

and making roads and erecting hotels and camping shacks and cabins. There will always be many square miles of rocky fastness and mountain chasm, cut by dashing torrent, where the poor wreck of humanity may pitch his solitary camp and for a period forget the ticker and recover from the madness of money grubbing.

The best thing about the Glacier Park is its closeness and the comparative cheapness by which it can be visited. It is of us; in our midst. Hundreds, thousands, of tourists visit the great Coast Range of Alaska every year, and view towering mountain masses and gleaming glacial fields, even as others throng to Switzerland so as to tell of having seen the far-famed Alps and of having been convoyed across a real glacier. But our Glacier Park is situated at the very starting point for Alaska, while, by those who have seen both, it is proclaimed as surpassing in variety of wild scenic beauty the most magnificent of Alpine scenery. Moreover, it is all American, and the sturdy adventurer can, if he desires, lose himself for months in its depths, fly the Stars and Stripes from his own tent-pole, and explore his own glaciers, for there are several score of them. Properly outfitted for strenuous mountaineering, he may spend a summer's season within the park, and come forth hardened, seasoned, reborn, and with an experience back of him which will be a lifelong pleasure.

Nature used titanic tools in creating these mountains and gorges, while in painting the rocks she left a riot of color. If one of the lofty pyramids or dagger-like peaks of the Livingston or Lewis Ranges, constituting this part of the Continental Divide, could be transplanted to our Eastern mountains, it would become a center for all tourist routes. It might be of glistening limestone, with iron stains, showing brilliant yellow, banded with a wide stratum of maroon rock or perhaps of deep terra-cotta or garnet-red, intensified by the gleaming white of a great overlying glacier—a sheet of everlasting snow and ice. Then, if



the mountain's vari-colored sides were reflected in the bosom of a splendid lake, the visitor would have before him one of the thousand units which constitute the sum of mountain chains of the Glacier National Park.

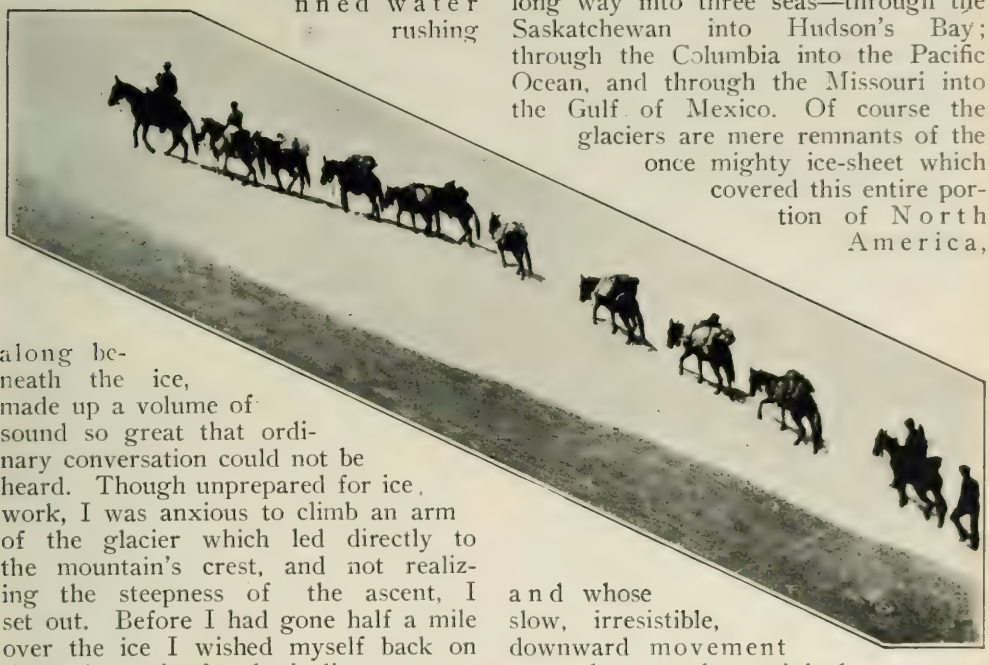
When any portion of the country is unknown to, or unmapped by, the United States Geological Survey, it can be set down as either very commonplace or a very impossible region. Ten years ago the Glacier Park was unknown to the intrepid topographers of this field organization, but since then the most beautiful of topographic maps have been made of the major and finest portion of what is now the park. In fact, the recent action of congress in creating the park was based largely upon the accurate information portrayed on these maps and the data procured by the members of these topographic parties—Messrs. Chapman, Sargent, Baldwin and Matthes—and by Mr. Bailey Willis, who made a geologic reconnoissance of the region, taking many splendid photographs and furnishing a description of its vast wealth of rock coloring.

A government topographic map, by the way, is a great thing. It will take four map sheets to cover the Glacier Park, of which three have already been surveyed by the men named. A party is now in the park completing the area. These sheets are for sale by the Geological Survey at Washington at the absurdly nominal price of five cents each. With these maps in hand you can lose yourself in the Glacier Park and then locate yourself again. They show every mountain shape and the altitude of every point, every slope, every glacier in accurate dimension, every one of the three hundred glacial lakes, every river and creek and canyon. These maps of the park will be of inestimable use to the visitor, whether he is simply curious to identify the prominent, well known features, or whether he wishes to pick out feasible trails and mountain passes of exploration.

Now lest the ambitious tourist fear that the region may be a "playground" in the Eastern sense of the term and that the ice fields will be found to be only "play" glaciers, here is a short descriptive passage from an account by George B. Grinnell, who did some real exploratory work in the park, even before the Geological Survey's mapping. Speaking of one of the glaciers, which was later named after him, situated at the head of the Swiftcurrent Creek, Mr. Grinnell says:

"I found this glacier melting rapidly in early September. It was everywhere

extensively crevassed and pierced by deep wells into which the brooks which seamed the surface of the ice poured with loud roarings. Indeed, the rush of many waters here was fairly appalling. The tinkle of the streams above, the echoing fall of the plunging torrents and the hiss of the confined water rushing along beneath the ice, made up a volume of sound so great that ordinary conversation could not be heard. Though unprepared for ice work, I was anxious to climb an arm of the glacier which led directly to the mountain's crest, and not realizing the steepness of the ascent, I set out. Before I had gone half a mile over the ice I wished myself back on the rocks again, for the incline was constantly increasing. I knew that if I lost my footing and began to slide down the sloping ice I should not stop until I had fallen into one of the bottomless pits or crevasses of the main glacier; and a man who has fallen into one of these would have but scant time in which to think over his past life. To attempt to retrace my steps would be greatly to increase the danger of making a fatal slip. There was no course except to keep on climbing. I made my way to the border of the finger of ice which was embraced by two shoulders of the mountain; but next to the rock it had melted away and I looked down into a deep trench which ran back far under the ice, and from the blackness below came up the roar of the torrent and the rumble of great rocks crashing against the stream bed as they were hurried along by the water. Keeping near the edge of the ice I slowly and carefully climbed higher and higher and at length reached a place where a point of solid rock jutted out to within six feet of the edge of the ice. Here I sprang across the chasm and landed safely on the mountain side."



There are some mountains of the Glacier Park from which the storm waters and the melting glaciers find their long way into three seas—through the Saskatchewan into Hudson's Bay; through the Columbia into the Pacific Ocean, and through the Missouri into the Gulf of Mexico. Of course the glaciers are mere remnants of the once mighty ice-sheet which covered this entire portion of North America, and whose slow, irresistible, downward movement scoured out the original, sharp, V-shaped valleys and great canyons to their present broader U-shaped forms. Yet there are some sixty glaciers left, many of them now being from one to five square miles in extent and seamed by mighty crevasses which no man may cross. Hundreds of mountain peaks in the park rise to a height of from 6,000 to 10,000 feet, while many of the canyon walls drop away a sheer 1,000, or 2,000 or even 3,000 feet, the roaring torrents in their sombre depths cutting them deeper, deeper, by their ceaseless grind, through the slow lapse of the ages.

The Glacier Park is now our second largest "playground," being exceeded only by the Yellowstone Park, and when the adjoining region to the north is set aside as a park by the Canadian government, as is expected, it will be the greatest of American parks. At present the park region is reached by a single rail-

GLACIAL STREAMS THAT COURSE DOWN 4,500 FEET OF MOUNTAIN SIDE.

road, and it is admitted that the tourist accommodations are quite inadequate to meet even the comparatively slight demand incident to the interest already aroused in this splendid territory. It is hoped, and there is believed to be a good prospect of it, that the energetic Canadian Pacific people will project a spur down from the north, especially in view of the contemplated action of the Canadian government in enlarging the park through the addition of Dominion territory at the north. Such transportation competition will be most wholesome and cannot but result in rendering easily available an unmatched and unmatchable region of natural beauty and wonders. Just now visitors should outfit with the expectation of genuinely "roughing it" in any trip to this region.

On Chapman's Homer

MUCH have I travell'd in the realms of gold,
And many goodly states and kingdoms seen;
Round many western islands have I been
Which bards in fealty to Apollo hold.
Oft of one wide expanse had I been told
That deep-brow'd Homer ruled as his demesne,
Yet did I ever breathe its pure serene
Till I heard Chapman speak out loud and bold:
Then felt I like some watcher of the skies
When a new planet swims into his ken;
Or like stout Cortez when with eagle eyes
He stared at the Pacific, and all his men
Look'd at each other with a wild surmise,
Silent, upon a peak in Darien.

—KEATS

MARTYRS OF SCIENCE

By

ARTHUR B. REEVE

IF peace hath her victories no less renowned than war, then Dr. Mihran K. Kassabian, who died in Philadelphia on July 12, was a hero perhaps of even greater caliber than the heroes of many wars. For Dr. Kassabian died of skin cancer brought on by X-ray burns in his marvellous work as one of the foremost specialists in America.

For years, unknown to many thousands of sufferers he was treating, Dr. Kassabian, slowly dying from the effects of the very rays that were being directed by him to the cure of others, went about his daily work. In common with practically all other X-ray men he suffered acutely from superficial burns induced by the mysterious energy given off by the Roentgen ray. The greatest secrecy was maintained about his illness, for he was very solicitous about keeping the facts from the public. But as far back as 1902 Dr. Kassabian first noted the deadly effect of the rays on himself.

In that year his hands were very seriously burned and in 1908 two fingers on his left hand were amputated. Last year it was found that the skin cancer induced by the rays had spread up the left arm and had caused the enlargement of the glands under his arm. These glands were removed by an operation by Dr. Chalmers Da Costa, professor of surgery in the Jefferson Medical College in Philadelphia. The wounds did not heal and a second operation, consisting of the removal of the larger muscles on the left side of the chest, was performed four months ago. After this operation on the pectoral muscles it was found that the whole left side had been affected and his condition was pronounced critical. About ten days before his death he went to the hospital to have his chest dressed and while there collapsed. He never left the hospital alive.

DR. M. K. KASSABIAN WHO SLOWLY DIED OF CANCER WHILE TREATING OTHERS FOR THE SAME DISEASE.

The fact of the matter is that the field of radio-activity has furnished more than its quota of martyrs to science. Professor Curie who with his wife, Madame Curie, won a place in the history of science by the discovery of radium was perhaps saved from a martyr's lingering death by the street accident which cut short his life. His journey to London with the first tube of radium ever exhibited there resulted in a wound in the chest which took months to heal, for the radium emanation passed through his waistcoat and underclothes and burned his chest to the bone. His experiments with radium scourged his hands and arms which were almost paralyzed to the elbows and rendered unpresentable to strangers.

In America the early history of the Roentgen rays was marked by the death of two men well known. One was Charles Dalley, chief assistant to Mr. Edison, and the other was Dr. Louis Weigel, of New York. For seven years Mr. Dally was a martyr to dermatitis caused by the constant exposure of his hands and arms to the rays. A cancerous growth developed

CHARLES DALLEY, AN ASSISTANT TO THOMAS A. EDISON, WHO FELL A MARTYR TO DERMATITIS.

DR. RADIGUET.
This French physician on his death-bed expressed his happiness at having proved the physical effects of X-rays.

PROF. PIERRE CURIE, WHO, TERRIBLY BURNED BY RADIUM, PREMATURELY MET DEATH IN A STREET ACCIDENT.

on his left arm, the lower part of which had to be amputated. His hair and moustache fell out and his skin became inflamed in many places. Four fingers of his right hand had next to be amputated. His forearm became affected, and in all one hundred and fifty grafts of small pieces of skin were made in an effort to save it, but it too was lost and finally the whole arm went. But it was of no avail and in September, 1904, his life paid the penalty of his devotion to science. After seven years of suffering, Dr. Weigel died in New York in 1906 after seven operations.

In September, 1906, there appeared in the British Medical Journal a letter from Dr. John Hall Edwards, president of the British Electro-Therapeutic Society. It was an appeal for help. A cancerous growth, dermatitis, due to constant exposure to X-rays, had appeared and he wrote: "I have not experienced a moment's freedom from pain for more than two years." For many years he has been a victim of this cancerous growth which resulted in the amputation of an arm. He was one of the pioneers in the field. By the aid of a radiograph taken by him the very first operation so performed was made. In 1900 he went to South Africa as radiologist and soon after his return it was that his malady first made its appearance. Gloves seemed to do no good. He understood perfectly how dangerous it was but still he continued his researches throughout his prolonged sufferings, concurrently studying his own disease and hoping to cure it. His only fear was that he would not live long enough to complete his book on the subject. Incidentally he has devised a method of warding off a large part of the evil effects of the rays on the operator by wearing steel gauntlets lined with rubber and an apron coated with lead. He in-

DR. WM. M. WIGHTMAN.
He died in Lima, Peru, a victim of yellow fever.

sists that the brief exposure to the rays that patients undergo is harmless.

Nowadays, however, the problem of safety has been pretty largely solved by the modern methods of operation of machines, since new operators have learned from the martyrs the effects of the rays and can protect themselves.

At a recent X-ray congress it was pointed out that there is now no excuse whatever for any injury being inflicted, at least on the patient. Professor Albery C. Geyser of the Cornell Medical College, whose own hand had been injured by the rays some time ago, devised a means by which the X-ray was robbed of many of its terrors and other discoveries have made unnecessary the fear of painful and disfiguring burns of patients. When he first exhibited his protective tube Dr. Geyser's own hands were swathed in bandages as a result of his experiments, but the tube has been used thousands of times since then without a resulting burn.

Prof. A. C. Geyser, Who Was Badly Burned By X-Rays While Inventing a Protective Tube.

Thirty years ago a doctor in Louisville wrote a book, which he called "Yellow fever heroes, honors and horrors of 1878." In it he gave a list of ten thousand victims and the martyrs' death roll of volunteer physicians, nurses, ministers and others who had died in fighting the epidemic.

In the face of the great calamity of 1878 the Louisville doctor wrote that for the first time North and South shook hands again over the bloody chasm of the War. They were terrible days. Some $4,548,000 was collected for the relief of the stricken and the total cost of the epidemic was upwards of $16,000,000. Yet that was only one of ninety times that yellow fever had invaded the United States from 1793 on in a terrible succession of scourgings.

Such a thing can never happen again. Never again will yellow fever call for such widespread heroism. For the heroism of another, smaller, group, of devoted men has destroyed our fear of the most fatal epidemic-disease in the western hemisphere, destroyed it in its favorite home port. The name of the man who did it is perpetuated by a small pension granted by Congress to his widow and is borne by a military hospital in Washington—Walter Reed. Today his name should be enrolled with those of Jenner and Lister and Morton.

Reed entered the army as assistant surgeon and first lieutenant in 1875. When the Spanish War broke out and camps were devastated by typhoid he was made head of a board to study the fever and after a year spent at it, patiently and accurately studying hundreds of cases, he made a report that is the basis of our recent study of typhoid. It contained among other original and valuable work the discovery that the common fly carries typhoid, as well as contaminated water,—a fact we are only now realizing pointedly.

In June, 1900, Reed was ordered to Cuba as president of a board to study infectious disease, with Acting Assistant Surgeons James Carroll, Jesse W. Lazear, and A. Agramonte. The situation was peculiar. Here after a year or so of sanitation health had been improved and the death rate lowered but yellow fever remained practically the same. What was back of this mystery? Fever was getting higher and hundreds of valuable lives of non-immunes were being sacrificed.

Dr. Howard Taylor Ricketts.
He met his death while studying the deadly typhoid germ.

Reed had a shrewd idea; he believed that sanitation alone was not enough. It had been proved that malarial fever was transmitted by mosquitoes and Dr. Carlos Finlay of Havana had advanced the theory that mosquitoes did the same for yellow fever.

Dr. Reed applied to General Wood, who was military governor of Cuba, for leave to experiment on non-immunes and for a liberal sum to compensate volunteers. General Wood promptly granted what was asked and, to the everlasting glory of the American soldier, volunteers offered themselves fearlessly and promptly.

Dr. Carroll allowed himself to be bitten by a mosquito which for twelve days had fed on the blood of a fever patient. He suffered a very severe attack, the first experimental case, but he recovered. Dr. Lazear also experimented; was bitten by a mosquito in the wards of the fever hospital and with calm precision noted each symptom of the disease as it broke out. Dr. Lazear had it in its most terrible form and finally died—the first of these martyrs to science. There was no other fatality among the heroes, though many of them came out of the ordeal shattered in health and with lives materially shortened.

Not until February, 1901, had the experiments reached a point where it was safe to take definite action on them. Then immediately the chief sanitary officer of Havana, Major William C. Gorgas, instituted measures based wholly on this report. As soon as a case was found it was promptly isolated. Rooms were fumigated and mosquitoes destroyed. Water was drained off stagnant places, tanks and vessels screened; breeding in other places prevented by putting oil on the surface of the water. That year for the first time in a decade very few cases appeared in Havana and since that time this formerly pest-ridden city has enjoyed a remarkable freedom. In fact it has so far overcome its fear that they can even admit cases from other ports and by proper screening prevent absolutely any further infection.

Reed's experiments will always remain as models in the annals of scientific research both for exactness and directness toward the point to be proved and for the precautions against vitiating by failure and error. Small wonder that when he returned to the States Reed was honored by medical schools and learned societies. He died in November, 1902, of appendicitis, and it has been said that if it had not been for his strenuous work in Cuba he might have recovered from the operation for that disease.

There are still heroes a-plenty. Next on the list of diseases that are being heroically conquered is typhoid.

Last April Dr. Howard Taylor Ricketts, surgeon of the United States Marine Hospital Service, died of typhoid fever in Mexico City. He had come from Washington for the purpose of studying typhoid in an endeavor to discover the germ of the disease for which the Government has offered a large reward. He fell a victim of his search and died in the little American Hospital. He had long been studying the disease and was one of the foremost research investigators of America, having an interna-

tional reputation for his excellent work.

The heroic death of Dr. John Herbert Wells of London last December, who succumbed to glanders after eighteen months of suffering, added another to this ever growing list of martyrs in the cause of knowledge. In fact someone has very pointedly said that nowadays every research student in a hospital literally carries his life in his hands and the least slip may mean a horrible death. Not long ago in Paris a young and skillful surgeon was operating when unexpectedly he inflicted a wound on himself which was infected with a discharge from the patient. The patient was in a critical state, when to stop an instant would mean loss of life. Yet if he did not promptly take measures to cleanse his wound it meant a terrible case of blood poisoning for the doctor, perhaps death. He never hesitated; he finished his operation on the patient and then turned his attention to himself. But it was too late. A few days later this modern hero died of the infection in the slight wound.

Dr. John Herbert Wells.
A London physician who succumbed to glanders contracted in his practice.

About six months ago the death was recorded in Paris of Dr. Jacques Antoine Regnier, son of a leading member of the Academy of Medicine, who contracted blood poisoning while conducting a post mortem examination in the Necker Hospital. On his deathbed he urged his friends not to grieve. "For," he said, "I die like a soldier on the battlefield. When you take up the medical career you are aware of the dangers and must be ready to face them." Such are the sentiments which animate most of the men who are today devoting themselves to the cause of science.

The death of Dr. Allen Macfadyen, the bacteriologist, in London a couple of years ago was due to a combination of two diseases which he contracted in the course of his search for a preventive of disease. Dr. Macfadyen was connected with the Lister Institute and was conducting a series of experiments with the bacteria of typhoid and Malta fever, with a view of discovering a vaccine to prevent these diseases. By an accident, it is believed, he contracted both and his name was added to the roll of martyrs of the laboratory.

A few months after the death of Dr. Macfadyen, occurred the death of Dr. W. H. Brown of Leeds, England, one of the leading members of his profession in that city and a specialist in the treatment of cancer. Two years earlier, while operating, he contracted blood poisoning and this, it

Major Walter Reed, Whose Vitality, Exhausted by Fighting Yellow Fever, Was Not Sufficient to Carry Him Through an Operation.

Dr. Allan Macfadyen
A noted English bacteriologist, who in his experiments accidentally contracted both typhoid and Malta fever.

was believed, led to the cancer which caused his death.

In the field of tropical diseases there have been many heroes. The name of Dr. Macatier Pirrie, who made two expeditions along the course of the Nile for the study of tropical fever, is recorded as that of a victim of scientific research. Dr. Pirrie went to the far ends of the Bar-el-Ghazal and to the borders of Abyssinia, penetrating some of the most deadly areas. He came home stricken with the disease he was seeking to eradicate. Although he wrote a paper for the British Association he was too ill to read it before that assembly and he died when he was only twenty-eight years old.

Many diseases have thus stricken down the men who fearlessly faced them. Two years ago during an outbreak of spotted fever in Rome Dr. Zampagnani while attending some of its victims contracted the disease, and, with death striding toward him, he sat down and wrote a treatise on the fever which before long proved fatal to him. At Turin Dr. Guiseppe Rosso experimented with tubercle bacilli which he developed in the university laboratory. He became infected with the very bacilli he had grown and his name also is inscribed on the roll of martyrs to science. Not long ago in New York a man who had lost both his wife and son of tuberculosis offered himself to the doctors of the city for experiments in the disease, a sort of human and voluntary vivisection in the interest of humanity and in memory of his lost family.

A most remarkable case of human vivisection has recently come to a successful end. The object of the experiment was to determine the functions of certain important nerves. The subject of the experiment was Dr. Henry Head, a physician in the London Hospital. Accidental cases for the study of this problem were rare and only indirect studies had been made, so Dr. Head offered his hand for purposes of experiment. In 1903 the necessary operation was performed which was the dividing of an important nerve, the excision of a small portion of it and the uniting of the two ends with fine silk sutures. Then followed a series of experiments performed by the most competent nerve specialists it was possible to obtain. For five years Dr. Head gave himself up to absolute quiet at Cambridge, and now the experiment is said to have been completely successful.

MORE WATER FOR ARID LANDS

By

FRANK N. BAUSKETT

THE Secretary of the Interior has sanctioned the construction of what will be known as the Engle dam. This huge piece of masonry is to obstruct the Rio Grande and is to be built in connection with the Rio Grande irrigation project. It is to lie in New Mexico and Texas, and includes several units; namely, the Rio Grande dam, the Leasburg Diversion dam, and the Engle dam proper. The Leasburg Diversion dam already has been completed, the waters which it stores being sufficient to irrigate twenty-five thousand acres of Mesilla Valley.

The reservoir that will be enclosed by the Engle dam will be one of the largest artificial bodies of water in the world. It will be forty miles in length and have a capacity of 2,000,000 acre-feet, or ample for the 180,000 acres of land to be supplied by its waters. The dam itself, from bed rock foundation to top of parapet walls or crest, is to be 265 feet high, or somewhat over two-thirds of the height of Niagara Falls. To hold in check the vast amount of water to be conserved, the

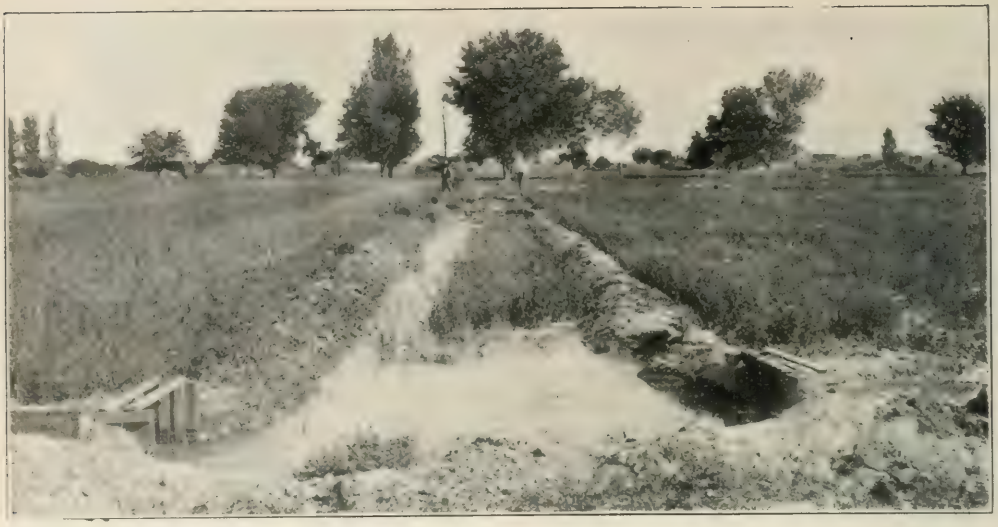
WHAT IRRIGATION DOES.
Country home in the Mesilla Valley near Los Cruces, New Mexico.

projected dam will be arched up-stream. The cost of the entire project is estimated at $7,200,000, or an average of $40 an acre on 180,000 acres. This is below the value of irrigated land in the valley, and the government will therefore eventually not only get back every dollar of the vast expenditure but will extend the first aid in the transformation of a wonderful desert into one of the most productive sections the country has ever known. The main item of the cost, of course, is the dam itself, approximating $5,300,000.

To the selection of the site of this reservoir attaches a peculiar interest from a historical standpoint. The region which is to be benefited by the waters to be harnessed by the big dam is today being irrigated by the oldest irrigation system in use in this country. In the first half of the sixteenth century Spanish explorers riding up the valley of the Rio Grande found in the midst of arid surroundings thrifty and industrious Indian tribes irrigating the thirsty soil as their forefathers had done for centuries before them, and as their descendants are doing today. This portion of the Rio Grande basin is known as the Mesilla Valley, and lies on both sides of the river between two spurs of the Rocky Mountains. Beginning at the north at Fort Seldon it extends almost to the corporate limits of El Paso on the south. On the east and west its boundaries are the lofty range of mountains, the highest of which, the Organ Mountains, rise to the dizzy height of 8,000 feet above the level of the sea.

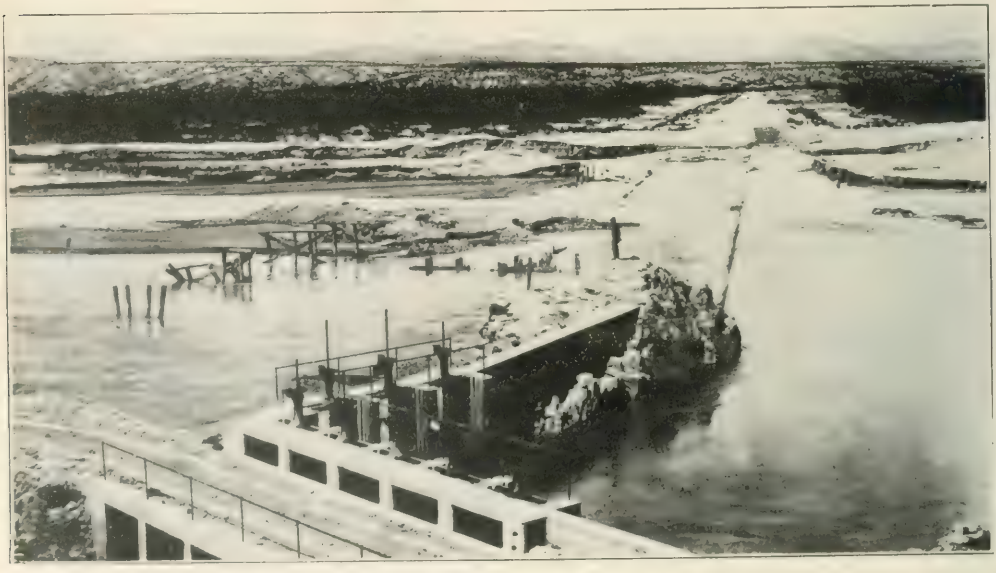
The first appropriations of water are for 180,000 acres. Of this 25,000 acres lie in Old Mexico, and the remainder in New Mexico and Texas. The Reclama-

THE RIO GRANDE PROJECT, NEW MEXICO AND TEXAS: SHOWING THE DAM SITE.
The broken line indicates the top of the Engle dam.



IRRIGATION OF ALFALFA CROP, LOS CRUCES, RIO GRANDE PROJECT.

tion service promises water for no more than 180,000 acres, and it is expected that the amount conserved by the project will be fully sufficient to irrigate 200,000 acres. Of this area, 110,000 acres lie in New Mexico, 45,000 acres in Texas and the remainder in Mexico proper. By a treaty between the United States and Mexico in settlement of claims on account of prior rights to the waters of the Rio Grande, this country agrees to deliver at the border, for the 25,000 acres lying in Mexico, 60,000 acre-feet of water annually. The rest of the land pays the Government for the project in ten annual installments. By the terms of the Reclamation Act no person may have water for more than 160 acres, but he must pay the annual installments for all the land he may own. This means that



THE LEASBURG DIVERSION DAM, RIO GRANDE PROJECT.

a person who may own more than the acreage allowed must sell and give some other fellow a chance. Uncle Sam considers that 160 acres of such valuable land is enough to guarantee any one an independent fortune, and he decrees that no man shall speculate in this undertaking.

This section of the country is one of the garden spots of the world, the principal products being fruit of all kinds, truck, melons, onions, sweet potatoes, asparagus and alfalfa. Farm crops may be raised, but not so profitably as fruits and truck. Apples and pears yield from 14,000 to 15,000 pounds and peaches average 20,000 pounds to the acre. The receipts from these fruits will run from $300 to $600 an acre. Grapes will yield from $400 to $500 an acre, and berries even more, as high as $800 per acre being figured on strawberries. The section is ideal for cantaloupe cultivation, the yield running as high as $800 to the acre. Onions have yielded as much as 12,000 pounds per acre, which means just about $1,500. Of course fruit and truck are costly crops to raise, and the figures given are gross and not net; but even at that they are marvelous. Fruit growing is assuming large proportions in New Mexico, and as rapidly as new districts are brought under irrigation, new orchards are set out. There are now more than a million trees bearing fruits valued at approximately $220,000 annually and development promises to be very rapid indeed.

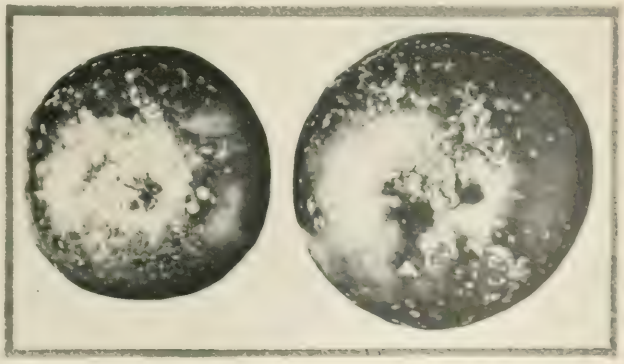
TO RID APPLES OF LIVE SCALE

By

ROBERT A. SANBORN

IT is perhaps not quite as difficult for American apples to get into Germany as for a camel to crawl through the eye of a needle, but still it is difficult. Many are sent, and many do pass by the rigid inspection at the wharves but a considerable number do not. Enough shipments are rejected to embarrass the exporters seriously with the necessity of finding a market elsewhere, and so to impress the officials of the North German Lloyd steamship line that they go with the problem to the United States Bureau of Entomology and appeal to the scientific gentlemen for a solution. The small but vicious, individual, whose name in Germany almost spells "taboo", for the American apple, is the San Jose scale.

The prohibitory law against fruit or nursery stock showing infestation with the scale dates, in Germany, to 1898. Since then the reports made by the chief inspector at the port of Hamburg show figures that well may worry the exporters and carrying lines. In 1900-1901 an almost negligible percentage, 1.24, of the



Apples Infested With San Jose Scale

Branch of Pear Tree Infested With Scale.

total number of packages of fruit imported was found to be infested. But in the very next year the percentage shot up to 13.4 per cent., in the next year to 7.1 per cent., and in 1905-1906 it was 11.1 per cent.; and in the nine years from 1898 to 1907 the average percentage of packages infested was over 6 per cent. Now if these figures correctly stated the amount of fruit actually rejected at this port the case would be bad enough, but they only do this partially. Under the German law the package that is opened by the inspector is judged as a fair sample of the entire shipment so that if the inspector discovers a scattering of scale in the one box or barrel he opens, he is authorized by the law to condemn the lot, which may consist of 50 packages or 200. Not only does the law operate drastically in this particular but it does not discriminate between live and dead scales. The 1.24 per cent found to be infested in 1900 means then that probably 10 to 15 per cent of the total number of packages shipped from America was stopped at the port of Hamburg.

Shipments that are debarred from Germany cannot be unloaded in France, where the restrictions are quite as severe. They can be taken to England, but that market is generally well supplied with American fruit so that with the profit cut down by rehandling and reshipping the rejected shipment is sold at a loss. The United Kingdom takes from 75 to 85 per cent of our export apples, and Germany from 4 to 16 per cent. In 1903-1904 Germany received at Hamburg 300,000 packages of our apples 6 per cent of which were found infested with scale.

The "What shall we do" cry is bound to increase in volume from our American exporters of fruit. The Bureau of Entomology has the answer ready. Fumigation of export fruit with hydrocyannic gas is recommended as an effective remedy to rid the apples of live scale.

Properly to fumigate fruit requires an air-tight cabinet in which the barrels or boxes are placed, first having gratings substituted for the heads or covers to allow the free passage of the gas. Potassium cyanide is used in the proportion of 0.10 gram, or a little more, per cubic foot of space, and the gas is generated by sulphuric acid poured in from a swinging cup by pulling a cord that hangs outside the box. The entomologists found that every scale was killed by this method and the only apple that suffered slight scalding by the strength of the gas was the Rhode Island Greening, grown in western New York. Others quite escape injury.

STARVATION AND TORTURE WERE THE PRICES PAID TO SATISFY THE PASSING FANCY FOR THESE GREBE PLUMES

DIE IN TORTURE FOR A LADY'S WHIM

By

WILLIAM L. FINLEY

A FEW years ago Fashion said, "Grebe skins are stylish." Fashionable women hastened to buy them. Since then untold numbers of western grebes have been slaughtered through the lake region of southern Oregon and northern California to supply the market. Scores of professional hunters have been busy shooting these birds and shipping out bales of skins. The grebes have disappeared in many localities.

The western grebe is a diving bird of glistening white breast and silvery-gray back. It is sought not without reason. The grebe hunters call the skin of this bird fur rather than feathers. The thick warm plumage seems more like the fur of an animal than the skin of a bird. It is so tough it can be scraped and handled like a hide. When these skins are prepared and placed on the market in the form of coats and capes, they bring the prices of the most expensive furs.

When the first grebe skins were sold years ago, they netted the hunter seventy-five cents each. This started the traffic all through the lake regions where these birds had extensive breeding grounds. A hunter could go out and make twenty or thirty dollars before breakfast. Many men started in the business. At that time the most extensive grebe colony in the country existed along the north end of Tule Lake, in northern California, where over a dozen camps of grebe hunters were at work. Not only the professional hunters were at work, but the ranchers of the country turned out to shoot grebes. They could make as much in one day shooting as in several weeks at farming.

After two years' constant shooting among the nesting birds, the professional hunters realized that grebes were diminishing in numbers, and they would have to seek other means of livelihood unless the birds were protected in the breeding season. They held a meeting and decided not to shoot on the breeding grounds.

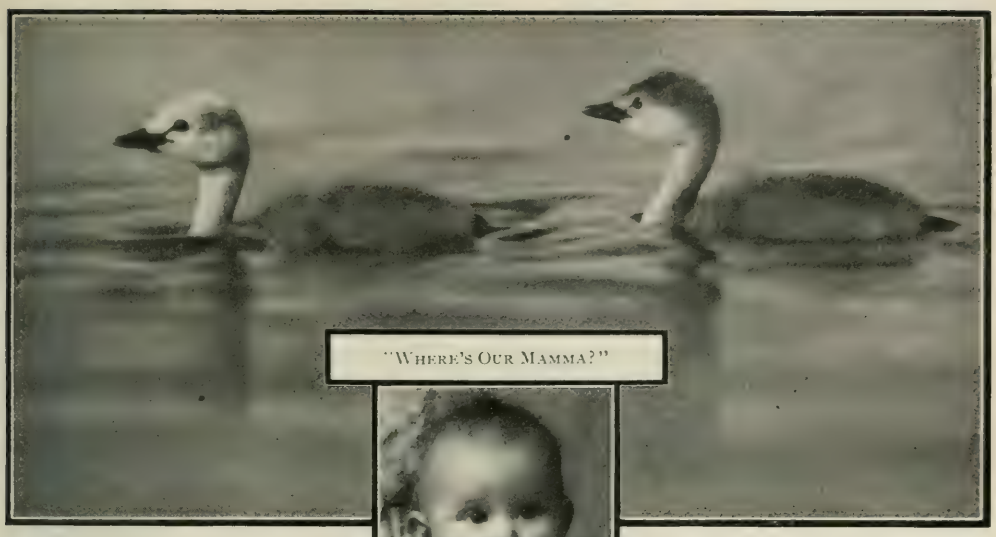
The farmers refused to abide by this rule, for they determined to shoot when and where they could make the most money. After that the birds had no protection at all. Hunters sought the main colonies, paddled in among the nesting birds and killed wherever they had a chance.

I have followed the trail of the grebe hunter. I have seen the effects of his work. I have seen a hunter make a grebe skin almost as quickly as I can explain the method. He picks up the dead bird, severs each wing with the blow of an ax, throws it on its belly and rips the skin down the back from neck to tail. He jerks the skin loose from the upper part of the body and severs it at the neck. Then, with his foot on the upper part of the body, the whole hide comes off with one jerk. The inside of the skin is a mass of fat. He throws it on the ground, gives it a few rapid scrapes with an old spoon, tacks it up to dry in the sun, and then it is ready to be baled for shipment.

The grebe is a bird difficult to shoot, because it swims so low in the water and is so quick at diving. "A special gun that will shoot a charge of shot within an area of a foot square at forty or fifty yards is what I use," said an old hunter. The favorite way of shooting was from a blind along a channel where the birds went back and forth from the feeding and breeding grounds. This hunter told me he bagged one hundred and thirty-five grebes in a blind of this kind at one sitting.

THE CLIMAX OF THE PLUME HUNTER'S ART.
The mother dead, and the chicks left to starve to death. This bird had been shot, and not found by the hunters.

Another hunter gave the following experience. "The best grebe shooting I ever had was at Clear Lake, where the birds were accustomed to swim up a narrow slough to the feeding grounds. I made a blind at the mouth and as the birds came out knocked eighty-four in rapid succession. As luck would have it, I went short on ammunition that morning. The birds were coming thick. I tied a lot of dead grebes together till



"Where's Our Mamma?"

"On My Mamma's Hat."

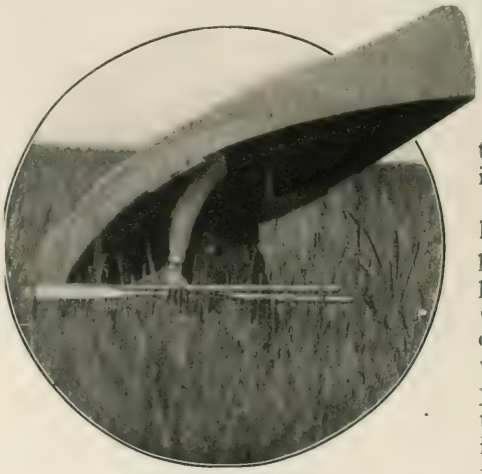
I had a rope reaching across the channel so as to keep the rest of the birds from coming out. I paddled back to camp for a supply of shells, and that morning bagged over two hundred birds."

Lower Klamath Lake on the Oregon and California border is a typical breeding ground for western grebes. About on all sides are extensive marshes of tules. When we visited the region in 1905 we found the whole lake border a veritable jungle, an endless area of tule islands with tules growing from eight to twelve feet above the water, between which is a network of channels. The tules have grown up for generations. The heavy growth of each year shoots up through the fallen stalks of the preceding season, and they have continued to die down and grow up until a fairly good floating foundation has been formed. In places, pelicans, gulls, cormorants and terns have perched and trodden down the tules, and on these floating islands they nest. In some places the mat of tules is buoyant enough to support a man, but it is like walking on a crust of snow, for you never know when it will break through.

When the grebe builds a nest, he selects a place among the tules around the edge of these floating islands and begins collecting the dead tule stems. He soon has a small floating platform entirely to himself. This is made quite thick and, when hollowed out a little on the top, completes the grebe home and it is ready for the three or four eggs which this bird lays. About one of these tule islands we found floating grebe

nests only a few feet apart. I counted sixty different homes in the space of about a hundred yards.

The grebes have a way of taking their young with them. The little fellows lie on the back just under the wing coverts with only the head sticking out. At the slightest alarm the mother raises her feathers a trifle and covers the chick completely. One can readily tell when a grebe has a chick on her back even if it is not visible, because she appears to swim higher in the water.



THE HUNTER OFTEN USES A CANVAS BOAT IN THE MARSHES.

Owing to continued shooting, the grebe is one of the shyest of all birds to study and photograph. At the sight of a person, he disappears like a flash and may stay under water quite a while, the next time appearing perhaps fifty yards away. For days at a time we crept about at the edges of these islands in the high tules, trying to picture these birds. By parting the reeds and building them up about us so we had a blind in which we could hide and aim the camera out through a narrow space, we made some interesting observations. Chances for pictures were few and far between as we sat patiently in a squatted position for hours at a time, but we had good chances to study grebe habits.

One day as I lay low in the reeds, a pair of grebes swam past. The back of one bird was high out of the water. She was carrying two young, but at the time neither was visible. Soon one of the youngsters grew anxious to crawl out, as it were, on the hurricane deck. Each time his head appeared the mother would reach back and cover him up. Finally he crawled clear out on her back in full view, but a moment later she raised her wing and covered him and nothing showed but his little head. Occasionally she picked up bits of something from

GREBE CHICKS JUST HATCHING.
Thousands of these are left to starve and burn to death in the sun.

the surface and reaching back, fed her babies. A little later while the father was swimming nearby, I saw one chick slip off the mother's back and go paddling toward him. He seemed to lower his body slightly in the water and the youngster floated aboard. I saw him dive and come up with the young rider still on his back.

But these home scenes did not last long. This nesting place containing about fifteen hundred grebe homes was soon discovered by two plume hunters. It took but a few days' work for them to shoot out this colony. I wish the American woman could have followed with me the trail of death and suffering after these two plume hunters left. We poled our skiff out through the tules till we came to a small grass island where the hunters had camped. Fifty feet beyond the edge of the camp fire was the skinning place. Here and there I saw piles of wings, each of which would have filled a washtub. The bodies of dead grebes were scattered about, thrown aside after the plumage had been stripped from their breasts. Each was marked by a buzzing throng of flies that swarmed up at our approach and settled back. On the left I counted a hundred rotting carcasses in one place. The stench was sickening. I turned back to meet a sight that was even worse.

Out through the tules where we had seen the birds thick about their floating homes, I found deserted nests. There were eggs on all sides never to be hatched. Beside several nests I saw dead grebe chicks that had climbed out in search of food that dead parents could never bring. I saw two homes where young grebes were starving and burning to death in the sun. Gray chicks were piping faintly for food. Worst of all were sights that brought tears. I saw grebe mothers that had been shot and not been found by the plume hunters,—mothers lying dead by their homes. In a small bunch of tules I saw a grebe baby trying to crawl under a dead mother's wing,—cold, helpless, starving. I can hear him crying yet.

HUNTER SKINNING A GREBE.
The body is turned on its breast, and a sharp knife slits the skin from the neck down the middle of the back. The breast, not the wings is sought.

No one could see the sights I have seen and not be moved. I thought of the women, even human mothers all through our enlightened land, who

A BUNDLE OF GREBE SKINS READY TO BE BALED FOR SHIPMENT.

spread this suffering and starvation among the homes of the wild fowl. Cursed be fashion! This is the price. How long will the American woman demand it? The grebe skins, the tern wings, the egret plumes, are the mothers' life blood. Hat plumes, worn for beauty, are but the signs of famished babies. Do you realize that, fair wearer?

The grebe skins that were taken in the Klamath country were shipped to a tanning company in San Francisco. This company handled the market end of the grebe business on the Pacific Coast. Grebe skins were handled in car load lots. In 1903 when some of the milliners refused to take plumage of these native birds, the Benicia Tanning Company still had a large amount of plumage on hand and additional plumage was coming in at a rapid rate. They immediately wrote the grebe hunters as follows: "Fashions in New York and Paris have changed; we can buy no more grebe or tern skins." For the time being, this put a check to the slaughter going on all through the lake region of southern Oregon. But the traffic opened up again in a year or so when the plume hunters began dealing directly with New York firms.

WHERE THE WINGS ARE CLIPPED OFF AND THROWN AWAY.

The lake region through

southern Oregon and northern California is such an extensive area that it cannot be guarded effectively by wardens. It is a difficult matter in this vast area to stop shooting that is so profitable to the plume hunter. The grebe slaughter has continued from lake to lake. Last summer when we explored the Malheur Lake region of southeastern Oregon, we found we were again following the trails of the plumers who had gone before. Although we have a state law against shooting grebes and other birds, the hunters have been at work continually. They have been shipping out bales of grebe skins and labelling them "coyote hides"—a trick no one will investigate.

Toward the end of the summer of 1907 after they had shipped out large bundles of these "coyote hides," suspicion was aroused and some sacks were seized at the express office at Burns and opened. These were found to contain eight hundred grebe skins. They were shipped from Lawen, a small town near Malheur Lake, and were addressed, like a great amount of other plumage sent from this region, to a well-known firm in New York City. Two plume hunters were immediately indicted, but they heard in advance that trouble was brewing and escaped to California.

FIFTY MILLIONS A DAY

By

F. G. MOORHEAD

IOWA had a job this spring for which it agreed to pay $50,000,000. The work could be done in one day. It required little experience, no book learning and an outfit costing only $3. Iowa offered the job to 210,000 men, guaranteeing to pro rata the pay without regard to politics, religion or previous condition of economic servitude.

The job consisted in taking six kernels from 80,000,000 ears of corn and testing them.

"If I could give one order that would be carried out by every farmer in Iowa, it would be to make a thorough germination test of at least six kernels from each ear of seed corn intended for planting," remarked Prof. P. G. Holden early in the spring. The word spread like proverbial wildfire and before planting time the doctrine of tested seed corn had been preached by word of mouth to 50,000 men, while the remaining 160,000 farmers in Iowa had had ample opportunity to get it by hearsay or through the daily and agricultural newspapers. The general managers of five great railroad lines heard of Prof. Holden's remark and ran special seed corn testing trains as a result, traversing hundreds of miles of the Burlington, Rock Island, Milwaukee, Great Western and North Western routes. They realized there were Colonel Sellers' possibilities of millions in the suggestion. It was too good an opportunity to go begging, so Iowa set to work making home-made germination boxes, preferring to test its seed corn in a fifty-cent box in the spring rather than in a $10,000 cornfield in the fall.

PROF. P. G. HOLDEN.
Father of the seed corn testing movement on which millions of dollars depend.

It was by no means difficult, this matter of adding $50,000,000 to the wealth of a state already rich beyond

A PERFECT FIELD OF CORN.
Tested seed corn brought about this stand of seventy bushels to the acre.

the dreams of avarice. There are a few more than 9,000,000 acres of corn land in Iowa; an increase of eleven bushels of corn to the acre means a total increase of 100,000,000 bushels for the state. The average price of corn is fifty cents a bushel, so that the 100,000,000 bushels increase would bring $50,000,000. It was such a simple problem in arithmetic that the average farm boy in the fourth or fifth grade could have satisfied any doubting Thomases, had any arisen.

The work was practically as simple. It consisted of each of the 210,000 farmers in the state picking out something like seven bushels of good seed corn, taking six kernels from each of the 560 ears in the seven bushels, placing these 3,360 kernels in six ordinary pine boxes, covering them with sheeting and damp sawdust and sitting around for a week until the kernels had had time, heat, moisture and oxygen enough to germinate. For this easy work Iowa guaranteed to pay each one of its 210,000 farmers $236.50 for the one day's work involved.

Iowa figured the matter out carefully. Tested seed corn means, at a conservative estimate, an increase of 11 bushels to the acre. Iowa devotes 9,000,000 acres of land to corn. The state has 210,000 farmers, which means that each farmer has, on the average, a 43-acre cornfield. An increase of 11 bushels to the acre means an increase of 473 bushels to the average cornfield. At fifty cents a bushel this means a revenue of $236.50. The av-

THE AUDIENCE CAR OF THE SEED CORN SPECIAL.
A typical crowd gathered in the testing train.

erage man can test enough seed corn in one day to plant the average cornfield of 43 acres. Hence an income of $236.50 a day for the work of testing the seed corn. Even in these days of $1 wheat and $11 hogs, such per diem is not to be despised.

PROF. M. L. BOWMAN.
He preached tested seed corn to 25,000 farmers this past spring.

Prof. Holden had good reason to want to issue that one order, "test your seed corn," this spring. Never had seed corn conditions been so serious in the state which leads in the production of America's greatest crop. A killing frost visited the cornfields early last October. Jack Frost got the seed corn before Mr. Farmer, with the result that less than one-fourth of the seed intended for planting this spring was fit and would germinate. Had this seed been planted without testing it is a foregone conclusion that instead of raising 300,000,000 bushels of corn this fall Iowa would have trailed along with Georgia and Kentucky and yielded only from 75,000,000 to 100,000,000 bushels, a mere molehill compared to its usual golden cereal mountain. So when Prof. Holden and his right-hand man, Prof. M. L. Bowman, set about to save the corn situation they not only figured out how much Iowa farmers could make with a few days' work, but how much they would lose if they failed to do this work. They had the farmer, both going and coming.

An ear of corn is a little thing, except where it doesn't grow. It contains about 1,000 kernels and each kernel planted should produce a stalk. Each stalk should produce an ear. A dead ear planted means the loss of 1,000 stalks and consequently 1,000 ears. There are eighty ears to the bushel, which means the loss of twelve and one-half bushels for each dead ear. With corn worth fifty cents per bushel the loss in dollars and cents would be $6.25 on account of one single ear that was bad. A bushel of seed corn is therefore worth $500 to the farmer when it doesn't grow. At this rate, a farmer could well afford to pay $250 for a bushel of good seed corn. He would double on the investment in less than four months. On $5 a bushel seed corn (a far higher price than most farmers are willing to pay) the profit would be equal to winning a 100 to 1 shot on a horse race.

And the most wonderful part of the whole thing is that this 100 to 1 shot winning can be made with such a little

A TYPICAL WINTER CROWD.
Even the winter did not keep the eager corn growers from flocking to the trains.

PROFESSOR HOLDEN INSPECTING AN EXPERIMENTAL CORNFIELD AT THE IOWA STATE COLLEGE FARM.

investment and with such little work. Prof. Holden and Prof. Bowman give the following formula for making a home-made germination box which is plenty good enough to bring about the $50,000,000 corn increase in Iowa this year, provided there are enough such boxes made and used.

"Any box about three or four inches deep and 30x30 inches in size may be used. Fill the box about half full of moist sawdust well pressed down so it will leave a smooth, even surface. The sawdust should be put in a gunny sack and set in a tub of warm water for at least an hour (or better still, over night), so it will be thoroughly moistened before using. Rule off a piece of good white cloth (sheeting), about the size of the box, checkerboard fashion, two and a half inches each way. Number the squares 1, 2, 3 and so on. Place it over the sawdust and tack to the box at the corners and edges. Lay out the ears to be tested side by side on the floor; remove one kernel from near the butt, middle and tip of the ear; turn the ear over and remove three kernels from the opposite side in a like manner, making six kernels in all, thus securing a sample from the entire ear. Place the six kernels at the end of the ear from which they are taken. Use care that the kernels do not get mixed with the kernels from the ear next to it. After the kernels are removed, boards may be laid over the rows of corn to keep them in place until the germination is known. Place the kernels from the ear No. 1 in square No. 1 of the germination box; from ear No. 2 in square No. 2 and so on. Lay a piece of good cloth on top of the kernels and dampen by sprinkling water over it. Then place over this a cloth considerably larger than the box and fill in on top of this with about two inches of moist sawdust and press down firmly, folding the edges of the cloth to cover the sawdust. Keep in a warm place where it will not freeze. The kernels will germinate in about six days. Then remove the cover carefully to avoid misplacing the kernels in the squares. Examine the kernels in the germination box and discard all ears that are worthless or show weak germination.

"Be sure to soak the sawdust at least one hour—or better still, over night.

"Leave at least two inches margin around the edges of the box to prevent freezing and drying out.

"Never use the box a second time without first thoroughly scalding both the cloths and the sawdust.

"Do not open too soon. The stem sprouts should be at least two inches long."

At the end of a week this simple germination box (made at an expense of not to exceed fifty cents) discloses an exact photograph of what the kernels of corn will do when they are planted in the ground. Either they have developed root and stem stalks strong and vigorous

A LECTURE AT A STATION.
Farmers by the hundreds drive many miles to listen.

—capable of taking hold in the ground, drawing up the elements of fertility necessary for life and shooting up into the air in the hundred day fight for fortune and the golden ear—or they have developed scrawny, sickly sprouts or they have done nothing at all but mould and prove their unfitness. And right here is where the value of the germination test comes in. The farmer can see at a glance what kernels do not develop at all or as they should. The kernels are lying on numbered squares on the sheeting in the germination box. The ears of corn from which they were taken are on the bench or shelf nearby, all numbered to correspond with the numbers on the squares in the test box. He can compare kernels with ears, throw away the ears whose kernels have not all developed strong and vigorous root and stem sprouts and keep those ears whose kernels have proved their fitness.

Nor should the test be any half-hearted one. In the past, Iowa farmers have used ears which showed four or five kernels out of the six tested coming out strong and vigorous in the germination box. Yet one kernel out of the six unfit means that one-sixth of the kernels on the ear, or 150 in round numbers, will not grow. Planting three kernels to the hill here is a loss of 50 hills. If only an average of 1½ ears was raised to the hill here would be a loss of a bushel of corn, fifty cents in value, for every ear of seed corn which tested one kernel bad out of six. The campaign in Iowa this spring was to use only such seed corn as tested six kernels strong and vigorous out of every six tried.

The effects of the campaign will be manifest this fall, when the corn is gathered by. Unless the advice is heeded and the seed tested Prof. Holden and Prof. Bowman are convinced that Iowa's corn crop will be nearer the 200,000,000 bushel mark than the 300,000,000 bushel mark. Three weeks spent in traveling over the state caused Prof. Bowman to issue a statement in which he said: "There never was a time in the history of this state when the seed corn was in such a serious condition as it is this spring. Every farmer should ask himself this question: "Do I know beyond a question of a doubt

Lecturers and Train Crew of a Holden Seed Corn Special.

that the corn I have for seed is all of strong, vigorous germinating quality?" and in this connection I may say that if it were picked after the frost he can be very sure that not more than one-fourth of it is fit to plant, at the very most. I firmly believe that if farmers would see to it that they got out into their fields the latter part of September, picked their corn before the frost, hung it up where it would thoroughly dry out before the cold freezing weather came on, that we would grow half again as much corn in Iowa, even though we did not test our seed. The great trouble is, too many times the corn is thoroughly frozen before it is picked for seed and then, instead of testing it before planting it in the ground, 80 and 100-acre fields are used as germination boxes. The average yield of this state is about 32 bushels to the acre and yet 40 bushels to the acre is only one nubbin, weighing 12½ ounces, to the hill. We plant three kernels to the hill, but a 40 bushel yield is only one hill out of every three yielding even a 12½ ounce ear. The other two

Corn Germination Box, 100 Ear Test. Six Kernels from Each Ear.

The crosses show where one or more kernels refused to grow. In only twenty-two squares of the hundred did all the kernels come strong.

stalks are wasted. In other words, we reap only one-third of the possible perfect corn crop. I would say that not to exceed one-fourth of the seed corn intended for use this spring was fit for planting. Every kernel planted should grow into a stalk and yield an ear of corn. Worms, bad weather and shiftless farmers figure in cutting down the perfect crop, but poor, untested seed corn is far and away the greatest factor."

This is no hobby of college professors, but has been proved over and over again in actual practice. Adjoining acres have been set aside as experimental plats, the one in which tested seed corn was planted yielding from 10 to 30 bushels more than the one in which untested seed corn was planted, both tracts having the same climatic conditions and being given the same cultivation and care. The records show that in some cases the acres devoted to tested seed corn yielded double those devoted to untested seed. All this has been taught year after year to the students of the agricultural colleges, but they are only about one per cent of the bulk of the farming body. The remaining 99 per cent must be reached and it is to effect this that the special seed corn trains were run throughout Iowa this spring and the farmers institutes and short courses were held this summer.

Even with the progress which is undoubtedly being made, the task of spreading the gospel of tested seed corn would be an annually recurring one if it were not for the scheme fathered by Prof. Bowman and explained by him to 25,000 farmers on the seed corn trains this spring. Prof. Bowman proposes nothing more or less than a special seed corn patch. Here is his idea as exploited several times a day for several weeks:

"Just as you would select animals for breeding purposes, select say fifty or sixty ears of the strongest, the most vigorous and the best seed corn you have. This will be the seed that you are going to use for your seed patch. No special preparation need be given this five-acre patch, other than that which you give to the rest. Of course, in all cases the seed bed should be thoroughly prepared before planting.

"In preparing these sixty ears for the seed patch you will, of course, shell off the butts and tips, as in the case of all the rest of the seed. The tip kernels are smaller, harder to plant, and the butt kernels are often extremely large and not uniform and for these reasons, if for none other, it is well that the ends of the ear be shelled off. It is not necessary to keep the kernels from one ear separate from the rest; just shell the sixty ears together and plant the seed in this five-acre patch. It would be desirable to plant this patch the very first of any of your corn and, of course, in fall plowing, preferable to spring plowing, in case it is sod land. Care for this five-acre field just the same as the rest. Cultivate

Poor Corn But an Inspiration for Any Farmer.

it right along with the rest and give it no special labor.

"Soon it will be time for the tassels and silks to appear and just here is where you will want to be sure and give this five-acre piece a little special attention. The silk is the female portion of the plant, the tassel is the male. And no doubt you have all noticed that whether or not a stalk of corn puts forth an ear it is seldom but that it puts forth a tassel. One silk is produced for every kernel of corn on the cob, ranging from 800 to 1,000 in number, but it has been determined that on the average a tassel has from 40,000,000 to 50,000,000 of pollen grains. Now one pollen grain is sufficient for the fertilizing of one silk. The pollen is blown about the field, lights on a silk, the silk is fertilized and the kernels of corn are produced. Take a butcher knife (which is about as good as anything to use), see that it is good and sharp and take a stroll out into this five-acre patch just when the tassels begin to appear and whenever you come to a weak stalk, a barren stalk or a sucker, cut it off right down close to the ground.

"And why should we go to the trouble to do this? Here is the reason. No doubt you have often gone out into the corn field the latter part of September to pick some seed corn and as you have walked here and there in the field you would find the large, well matured ears. Possibly you took a great deal of pains to examine the stalks from which these ears were taken, but did you ever stop to consider what sort of a father those seed ears had? Of course, you have appreciated that the sins of the father are visited on the children to the third and fourth generation, but have you stopped to consider the fact that half the kernels on a large, fine ear of corn picked promiscuously in the field might have had as their father a little, runty stalk which is so commonly growing in every corn field in Iowa? Now, then, I am sure you will see just why we should go into the five-acre seed patch and eliminate every weak stalk and barren stalk, so that the pollen which is produced in that five-acre patch we know to be pollen from good, strong, vigorous, producing stalks. Then when we pick our seed corn we can not only study the mother plant, the stalk, but we also will know that the father of the ears of corn which we pick for seed was equally strong and vigorous.

"Now, then, the latter days of September (which is the time for picking seed) when you tell your wife that it is about time you were getting your seed corn and sling the sack over your shoulder and start off for the field, where will you go? Will you stroll around through that forty or eighty-acre field of yours? No, the very strongest, most vigorous, most productive seed you have is planted in a five-acre patch. You eliminated all the weak and barren stalks and suckers from this field. You know that the best seed corn you have on the farm is right where you planted and cared for it in that small five-acre field and so instead of walking over a large area you go right into that five-acre field and soon you will have picked a sufficient amount of seed for the planting of your fields the coming season. Such a practice will substantially increase the yield and the quality of your corn crop and add millions of dollars annually to the income of Iowa."

THESE PAGES ARE INTENDED TO BE READ WITH THE MICROSCOPE.

LIBRARY OF MINIATURE BOOKS

By

DR. ALFRED GRADENWITZ

THE possibility of reducing written or printed papers by photography was pointed out as far back as 1865, by an Englishman named Simpson, and five years afterwards, in connection with the siege of Paris, an opportunity was afforded of giving this process a practical test, in conveying dispatches from the provinces to the beleaguered city. Photographic films attached to the legs of carrier pigeons, were used to condense up to 1,500 dispatches, which on receipt were magnified with a magic lantern, and after being transcribed, were delivered to their addresses.

Recently Prof. Robert Goldschmidt and Paul Olet in Brussels drew attention to the possibilities of using a similar process in the photographic rendering of scientific magazine articles and whole books.

In photographing a book there are two possibilities, allowing the pages to be either cut and pasted side by side on a smooth surface, or else photographed successively from the unbroken book. The apparatus designed by Goldschmidt is intended for successively photographing the pages of the book, without cutting them asunder.

The photographic studio is separated by a partition wall into two sections. The partition comprises a window of very

TWENTY FIVE PAGES REDUCED TO THE SIZE OF ONE.

plain glass, the dimensions of which are adapted to the size of the book, by means of convenient patterns. In front of the window is installed the photographic camera and the lamp, and behind it the open book, and the operator actuating the cover of the objective and the mechanism for displacing the sensitive plate from a distance. As soon as a double sheet has been photographed, the page is turned over, and after again pressing the book against the window, the photographic

plate is displaced, and the cover of the objective is removed. By means of a simple mechanism, 500 pages of an octavo volume can thus be rendered photographically, on a plate of nine by twelve centimeters, within one half to three quarters of an hour.

A general introduction of the process would result in something like a revolution in present libraries. The loss of precious documents—MSS., rare books, etc.—would in fact entail no loss of their contents, and the microphotographic record—which may be manifolded in any numbers—could be readily used in the place of the original. Owing to the easiness of manifolding and the small space required by the microphotographic books, it would be further quite feasible for many libraries to acquire practically all important documents, thus making their readers independent of any other libraries. Even the book stores, which take up such enormous space, could simply be replaced by a collection of cards, located within a few sets of drawers, and owing to the relatively slight cost, even private parties might be in a position to purchase such microphotographic libraries. As it is, the new process would, on the one hand, allow the existing material to be centralized far more than heretofore, while, on the other hand, each scholar could readily become the owner of the whole literature covered by his branch.

BRINGING NATURE BACK TO OUR GREAT CITIES

By

ALLAN SUTHERLAND

SOME fifteen years ago a few public spirited citizens of Detroit had a vision of the possibility of bringing together the vacant lots and the neglected dwellers in the slums of their city. With the eye of faith they saw ugly bare spots changed into blooming garden plots and barren lives transformed through intimate contact with their soil.

The experiment was tried and students of social problems everywhere watched it. The result has been astonishing and needs no other comment than that the

UNEMPLOYED MEN FIND WORK IN PREPARING THE LAND.

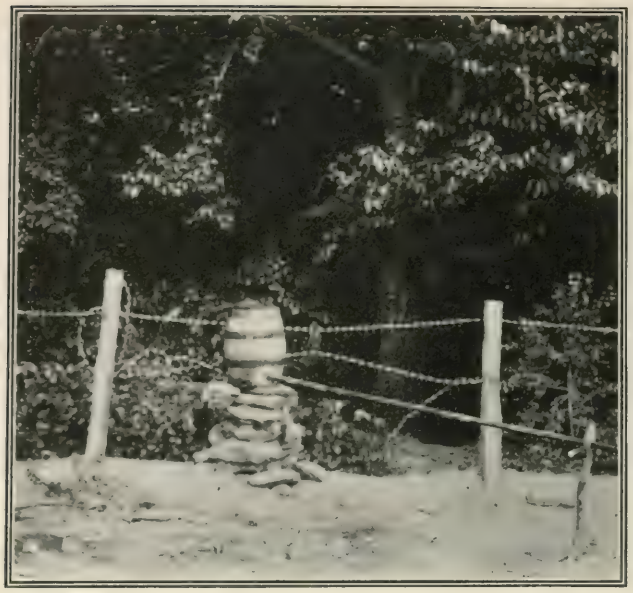
ASSIGNING GARDENS IN THE EARLY SPRING.
Each one in the group is anxious to work on the soil.

result inaugurated by these pioneers has been taken up by a number of other cities, in imitation, with success. With but little effort indigent persons have been encouraged to enter upon the cultivation of vacant tracts and enthusiasm has been invariably found among those to whom the opportunity was offered.

Probably the greatest success, however, has attended the experiment as carried on in Philadelphia. These hundreds of acres have been made to minister to the well-being of the poor and interest in the work is so wide that it is probable thousands of acres of additional land may be utilized for the purpose.

Philadelphia made its start in this work as far back as 1897. From the beginning new land has been constantly added to the amount under cultivation. Twenty-seven acres were turned into garden plots in the first year; in 1909 one hundred and fifty acres were under cultivation. From five hundred beneficiaries in 1897 the number has increased to four thousand. About $6,000 was the total value of the first crop, while

THIS VACANT LOT IS THEIR SALVATION
A widow thus supports herself and six small children



KEG RESERVOIR FED BY LITTLE STREAM.
A sunken barrel supplied by gravity from keg reservoir furnishes a handy water supply for gardens with little effort.

so large a sum as $40,000 was realized for a later crop. To produce this splendid result an outlay of less than $6,000 was necessary, or in other words, there was a return of about eight dollars for every dollar invested.

This is the plan of work: The Vacant Lots Association of Philadelphia, through its superintendent, James H. Dix, borrows from generous owners of real estate vacant tracts of land, with the understanding that these are to be surrendered on demand. These tracts are divided into small patches, ranging in size from one-eighth to one-fourth of an acre, though in exceptional cases as a recognition of good work done, they may be larger. All allotments are made subject to the following rules:

All gardens must be cultivated thoroughly as the superintendent directs. Gardeners and their families must not trespass on other gardens or neighboring property and must not annoy other gardeners or neighbors. The use of the garden is accepted, subject to the same terms of eviction as those under which the Association holds the land. No tool boxes or shanties shall be erected on the garden, unless directed by the superintendent. Each gardener must turn in a

THE HARVEST IS TAKEN HOME IN A BABY CARRIAGE.

EACH OF THESE WOMEN HAS A GARDEN.
They are neighbors and sociably help each other at their work.

report, at the close of the season, of all crops grown; whether sold or used. superintendent's decision is always final. Failure to comply with any rule may cause forfeiture of the privilege to use the garden at any time.

To the would-be cultivators of these lots, a large number of whom are old men, invalids and children, the association furnishes some seed and fertilizer and directs the work of planting and gathering the crops of potatoes, peas, cabbage, beans, tomatoes, onions, flowers, etc. While each gardener is given the largest liberty as to what he shall plant and cultivate, in order to obtain the best results, the association distributes to the gardeners the following assortment of seeds: one bushel of potatoes, one quart lima, one quart string beans, one quart wax beans, one pint main crop sugar corn, one quart peas, one quart onion sets, two ounces beet seeds, two ounces radish seeds and several dozen tomato and cabbage plants, the quantity depending on the season's supply.

Day by day throughout the season the workers gather on their respective gardens to plant their seeds, or to cultivate or gather their crops. Many of the gardeners do the hardest part of their work during the early morning hours and then again towards evening, when the weather is cooler; often the passerby sees crowds of them working on their little patches until it is so dark that they can do no more. In this way, the old folks and the children can enjoy the work and its many benefits without becoming fatigued in the heat of the day.

The superintendent and his assistant teach the traits of the various plants and diseases, weaknesses and peculiarities of each, how to know weeds and insects, and the proper method of fighting each. Agricultural bulletins, pamphlets and periodicals are at times distributed, so that the gardeners may continue the study of the work in which they quickly become intensely interested. The giving of such information is no small part of the usefulness of the association, for thus many gain a knowledge that not only quickens their interest in nature, but will stand them in good stead in after years should they live in the country. Already good reports are coming from many of the children who a year or so ago were

training on vacant lots and who now have good positions on truck farms near the city.

To persons absolutely needing immediate help—consumptives and others out of employment—work is given during the season at the co-operative farm. This farm was started six years ago. Last year more than one hundred persons were given employment and paid at the rate of $1.50 a day. When the crops on this farm were matured the Association sold them to repay its treasury for the amount paid the workers.

Fancy gardening has also been tried by embryo farmers in public school gardens, and a heavy crop of tobacco, peanuts, watermelons, flax, sweet potatoes and other Southern luxuries is on the way. In the eight gardens maintained by the Philadelphia Board of Education which are the outgrowth of vacant lot gardening in Philadelphia one thousand farmers are weeding, hoeing and spraying their plants with insect destroyer and fertilizer, giving them the daily care bestowed by real agriculturists. In addition to growing these products, teachers are instructing the amateur workers in commercial values, giving object lessons to accompany the farming lessons.

Besides the individual gardens tended by one thousand children, there are class plots which give work to six thousand little ones, and there are many kindergarten beds where four-year-olds work with hoe and rake.

A striking example of the possibilities of this work for even the weak and inexperienced is given in the case of a little mother and her three children, who worked a garden several seasons. This little family who were existing as best they could without the husband and father, were having a difficult time to get life's necessities. The mother became quite ill and was unable to attend to her work. She was assigned a garden—a plot a little less than one-fourth of an acre. She was totally inexperienced and the many mistakes she and the children made in planting their crops and cultivating them, in the absence of the superintendent, would have been humorous if the struggle for existence had not been so serious. However, the mother and the children working together were enabled to get considerable food for themselves

HALF AN ACRE OF LAND SUPPORTS HIM.
An old negro who makes $250 a year from his diminutive farm.

A SUCCESSFUL GARDENER AT SEVENTY.
Aged Italian woman setting out cabbages.

and a little surplus to sell; then they received instruction and experience, which proved of great value the following season. At the end of the second season, when they were assigned enough additional land to bring their holding up to about one-third of an acre, they reported that they had had a supply of fresh vegetables for themselves during the summer, and that they had put up for winter use twelve bushels of potatoes, fifteen quart jars of tomatoes, seven quart jars of beets, ten quart jars of string beans, eight quart jars of lima beans, six quart jars of corn and six quart jars of peas, and had sold to their neighbors $112.09 worth of product.

Many of the gardeners, after a few years' experience, become quite expert. The old colored man in the illustration reported crops last season to the value of about $250.00 from the half acre he cultivated. His main crop was celery, from which he got about $70. He had sold a successful crop of peas from that same portion of the land before he put the celery in it.

One man, who was allowed to do some of this preparatory work was about to be put out of his home and his goods sold. The superintendent arranged with the constable to postpone the sale until the man was able to earn a little. Afterwards, this man applied for and was assigned one of the family gardens. He was enabled to keep his family together, and himself in good condition until he secured his old work, later in the year.

Striking examples are often witnessed of the way many families appreciate the opportunity to work in the gardens, and of the way these people sympathize with each other. A number of gardeners who had cultivated land for several seasons and had received great help from them, came to the superintendent and asked to surrender their plots that these might be given to others who were in greater need

than they at the time. One family who had worked their garden well for several years and by its aid had been able to get an upward start, told the superintendent that they fully realized what it had meant to them the last few seasons, but they also realized that some of the families they knew in the neighborhood were in much more need than they, so they asked him to give the gardens to the other families.

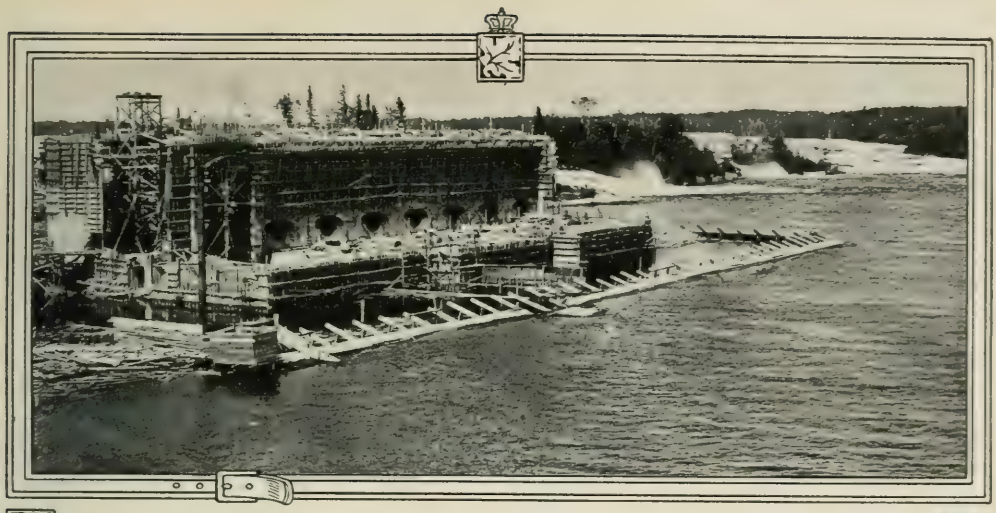
In addition to the large number of men and women of middle age, or under, who aided their families by working the gardens, many old people cultivated them, in one year the oldest woman being seventy, and the oldest man eighty-four. The woman of seventy had no one to depend on but herself. She had worked the garden for several seasons, raising her supply of good food, and selling her surplus for cash to go towards the rental of the little room where she lived.

Many invalids and cripples also find a source of benefit in the gardens. A dentist, forty-one years of age, who on account of physical breakdown, was compelled to cease practicing in his profession, and was reduced to very humble circumstances, was assigned a garden. He spent the summer on it endeavoring to regain his health and secure the products to aid in the support of his family. A crippled house painter applied for a garden and tried to work it with the assistance of his wife; he was later taken seriously ill and for a long time the family had nothing upon which to depend except the produce his wife could bring from the garden.

A man about seventy years of age, who suffered from an incurable affliction, worked a garden for the support of his wife and seven children. His garden was located on poor land which had not been worked before, but so constant were his efforts in fertilizing and cultivating it, that the results were among the best.

From time to time in various locations, there are many difficulties to overcome and local problems to solve. The gardeners are encouraged to do as much as possible themselves in the way of overcoming the difficulties; thus they become still more self-reliant and learn to work out their own salvation, instead of depending on others. One of the most common of the difficulties is the securing of an adequate water supply in dry weather. An accompanying illustration shows how a group of gardeners have arranged a water supply. Down through the trees bordering the farm, a small stream runs. But it would have been a tedious task to carry sufficient water from the stream to keep the crops on the inner gardens in good condition during dry spells. Therefore this group of gardeners erected a stone base and set on it a large keg near the stream. This keg was readily filled from the stream. A pipe line runs from the keg to a sunken barrel, located at some distance. In this way water is supplied to the inner garden with little trouble.

Among the many beneficent results of the noble efforts of this Association, a few only can be hinted at: Hundreds have found employment who would otherwise have been idle; land has been rescued from weeds and unsightly rubbish and made to fulfill the God-given mission of bringing forth fruits and flowers; in their labors, men and women have been made to feel that what they received was theirs by right of toil; old people, too infirm to work elsewhere, and invalids in need of recreation, have found health-giving employment; little children, who at best could hope only for "a country week," have found a glorious "country summer." They have been brought into close touch with nature and its charms. They have become filled with "a noble discontent" and have received inspiration, before unknown, to do, to be something above and beyond their old ways of living.



FIRST SECTION OF WINNIPEG'S BIG MUNICIPAL POWER HOUSE.
Sixty thousand horse-power will furnish the city of Winnipeg with cheap electric light and energy.

NEW EXPERIMENTS IN DEMOCRACY

By

HENRY M. HYDE

UP north of the international boundary line something very like a revolution is in progress. And it is none the less revolutionary because it lacks the noise and fury which accompany the spinning of the squirrel cage far to the south. Very quietly and with a certain grim determination the people of Canada are moving steadily forward on new—and in some cases—startling lines. To the radical the Canadian policy of public ownership and control may serve as a hope and inspiration; to the conservative as a warning and a menace; but to every man of intelligence it must be a matter of keen interest.

Where in the United States there would be long and angry debate, hesitation, delay and general alarm, the Canadians plunge straight ahead with all the buoyancy and confidence of youth, upsetting traditions; hewing a new path through the wilderness they have reclaimed; too busy in doing to spend time in talk.

Putting into practical use many of the teachings of the socialist, they utterly deny any sympathy with socialism. Adopting, as do some of their largest cities, the single tax on land values, they declare they are no disciples of Henry George. Boasting themselves a pure democracy and recognizing the voice of the people as the supreme law, they swear willing allegiance to King George of England. And all these apparent inconsistencies only add to the compelling interest which must always attach to the spectacle of a new empire in the making.

Winnipeg, the capital of Manitoba, a thriving city of one hundred and fifty thousand people, nearly four hundred miles north of St. Paul, is one of the leaders in the new movement for making the government of more direct and general service to all the people. For years the city has owned and operated its

water works plant, street lighting system, municipal stone quarries and—unique among the cities of America—an asphalt plant where the material for laying and repairing street pavements is produced. Now, taking another great step forward, Winnipeg is approaching the completion of a great hydro-electric power plant, publicly owned, and capable of producing a maximum of sixty thousand horse power, per year.

The plant is being built and will be completed next spring at Point Du Bois, sixty miles from the city, where the Winnipeg River drops over a fall of thirty-three feet. The city has purchased a right-of-way one hundred and fifty feet wide and sixty miles long leading direct to the plant. It has also purchased a quantity of land lying just outside the city limits, and at present undeveloped, which will be held for future sale to manufacturers at a cost not to exceed two hundred dollars an acre. This land is located where all railroad facilities are available and improvements leading to it are now under construction. For the purpose of securing funds for the building of the dam, power plant and transmission lines, forty year city bonds were issued, finding a market in London, to the amount of $3,250,000.

The object of building the great power plant is to provide a large supply of power, which will be available to manufacturers at low rates. This is necessary because there are no coal or other fuel deposits close to Winnipeg and production of power by means of steam is therefore a most expensive process.

When the Point Du Bois plant is opened power will be available at rates varying from eighteen to twelve dollars per horse power per year, the plant working, of course, night and day.

It is expected that, within a year or two after the plant is opened, the receipts from the sale of power will not only pay the running expenses, but will be sufficient to establish a fund for the redemption of the bonds at their maturity.

The municipal plant will also furnish power for city lighting and other mu-

WINNIPEG WATCHES WELL THE PROGRESS OF ITS BIG ELECTRICAL POWER PLANT.

Members of the Board of Control and City Council on an inspection tour.

PRINCE RUPERT HAS A MAGNIFICENT LOCATION.
Entrance to the harbor overlooking the docks.

nicipal purposes and the saving thus made will be, in itself, a considerable one.

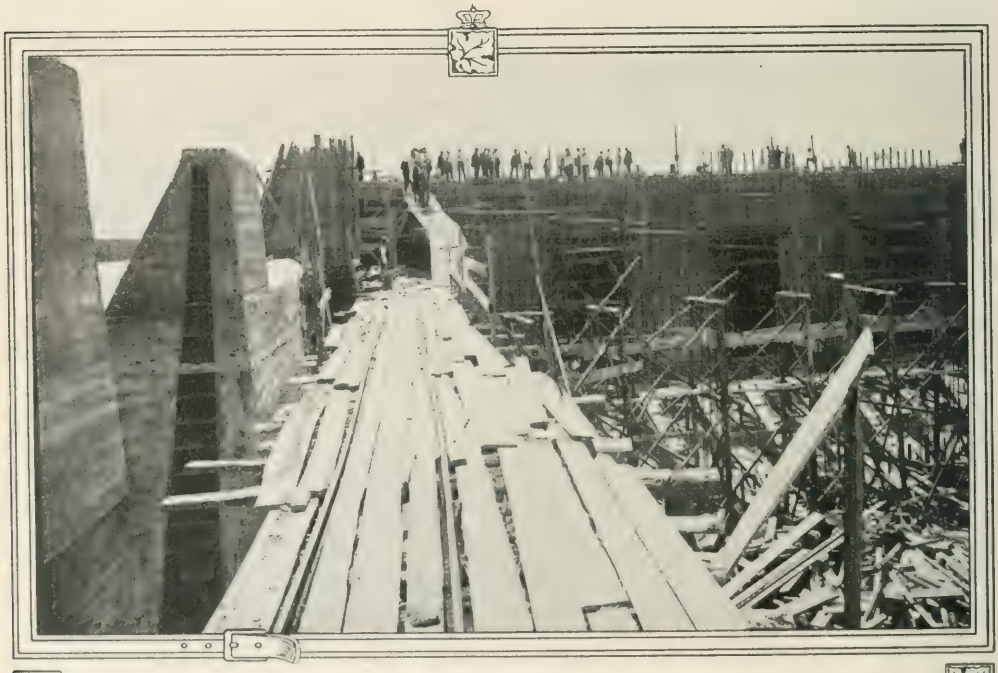
Equally significant is the action of the cities of the Province of Ontario in securing for themselves and for their citizens an unlimited supply of electric power from the great falls of Niagara.

When the Canadian government granted concessions for the installation

RIVER WALL AND ROCK FILL DAM TO DIVERT THE BY-FLOW OF THE WINNIPEG RIVER THROUGH THE INTAKE CANAL
The upper water level will be raised sixteen feet.

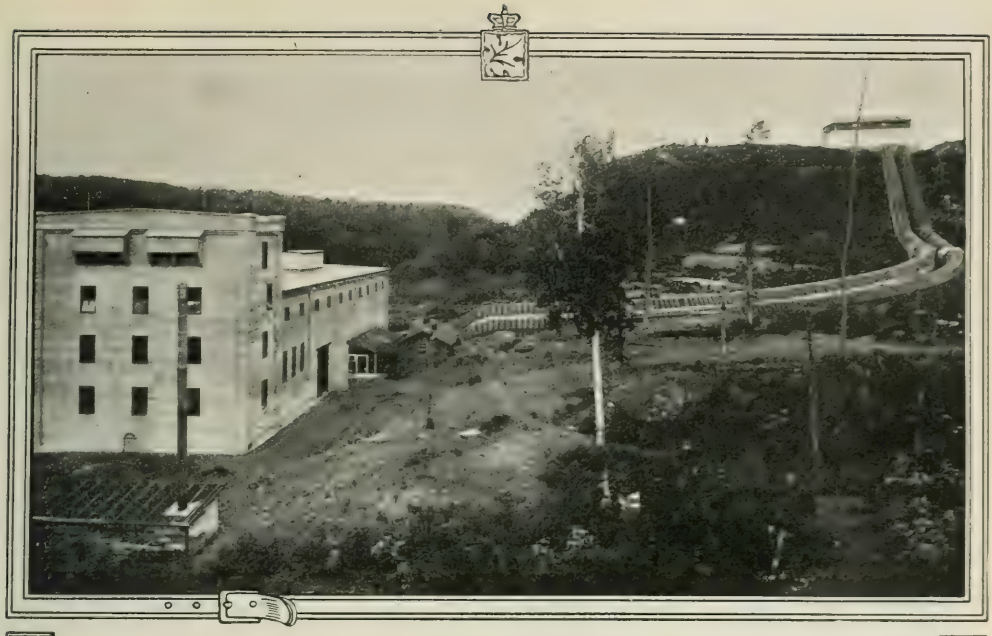
BIG FALLS IN THE WINNIPEG RIVER WHERE SIXTY THOUSAND HORSE POWER IS BEING DEVELOPED.

of power plants at Niagara Falls it exacted a certain regular royalty which already brings into the treasury several hundred thousand dollars a year. But it was presently found that the demand for power on the southern side of the



PORTION OF CANAL WALL ADJOINING THE EAST END OF WINNIPEG'S NEW POWER PLANT.

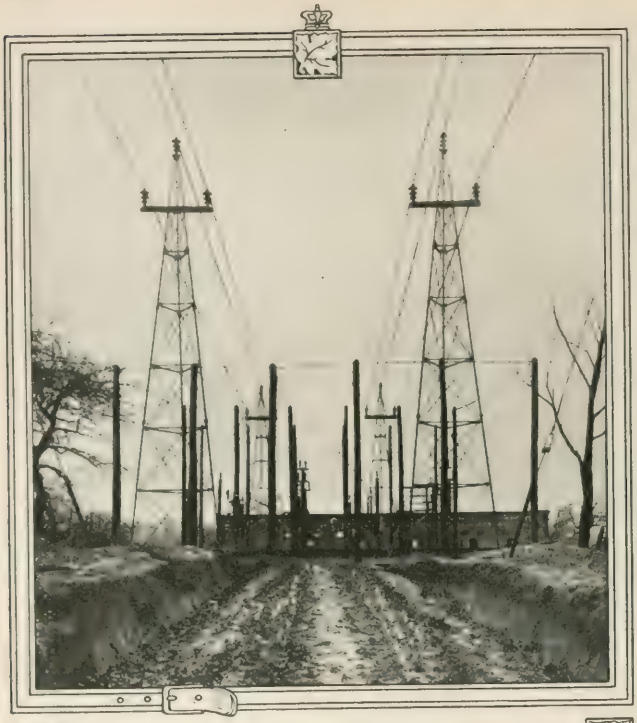
The total cost of this work will be $3,250,000.



WHERE PORT ARTHUR GETS ITS ELECTRIC POWER.
This plant is situated at Kakabika Falls.

boundary line is very great and that practically the whole supply developed at the Canadian Falls was sent across into New York State. This situation did not suit the thrifty Canadians and they decided to change it. First of all the cities of Ontario got together and by bringing pressure to bear through the government officials finally secured a contract from the corporations develop-

THE DOCKS AT PRINCE RUPERT, ONE OF CANADA'S MOST PROGRESSIVE MUNICIPALITIES.



The Sort of High Power Transmission Line Winnipeg is Building.

ing power at Niagara Falls, which gave them the privilege of buying practically any number of horse power at a rate which will not run greatly above ten dollars per horse power per year.

Meanwhile, backed by the provincial government, the allied cities of Ontario have already built a great net work of electric power transmission wires running for a total length of two hundred and ninety-three miles and making the magic current available almost anywhere in the province.

At the same time other Canadian cities and provinces are taking further steps towards bringing divers and sundry industries under public control and direction. In the province of Alberta, for instance, there are more than twenty creameries built at public expense, with an expert, furnished by the government, at the head of each. From these government creameries millions of pounds of butter are turned out yearly. Each pound is marked with the government stamp which guarantees its purity and weight. In connection with the creameries cold storage plants have also been established, under the direction of the government, where surplus supplies of butter and cheese may be stored and insured at government expense until they are sent to market.

In several of the western provinces also, the government has been instrumental in erecting grain elevators and everywhere is taking an active part in assisting the farmer not only in increasing his crops but in getting them to market to the best advantage.

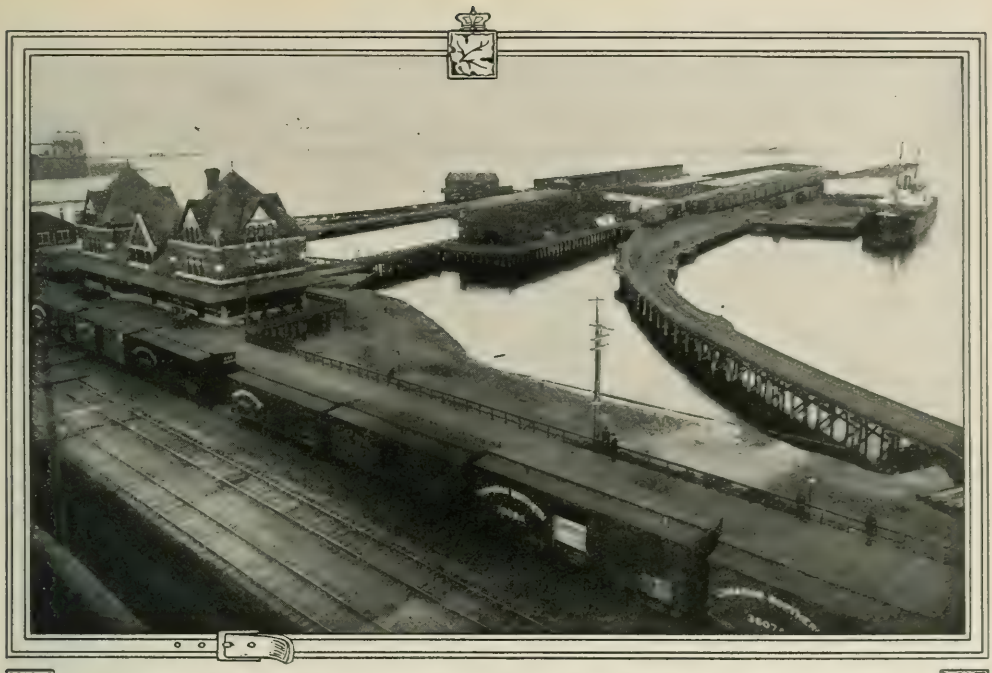
Up on the northern shore of Lake Superior are located Port Arthur and Fort William, two towns which lead the advance, even in Canada, in the matter of public ownership and control. Port Arthur, especially, boasts that all its public utilities of whatever nature, are publicly owned and managed. It has a municipal power plant on the Currant River, it owns its own telephone system and it owns and manages its street railway system, in addition to the water, sewerage and lighting systems.

The operation of the street railway system, already extending over a number of years, has been so far profitable that in addition to paying all operating expenses and setting aside a certain sum towards the sinking fund, the net profits remaining are sufficient to pay half of the total expenses of the city government.

In the operation of the telephone system, the price to telephone subscribers has been greatly reduced. A residence phone costs twelve dollars per year in Port Arthur and a business phone twenty-four dollars, as against thirty-six dollars, which was the charge under private ownership.

The province of Manitoba as a whole, also owns its own telephone system, the provincial government building the long distance lines, which connect the various local and municipally owned systems.

Even more startling, because quite un-



TERMINALS OF THE CANADIAN NORTHERN RAILWAY AT PORT ARTHUR.

RAILWAY AND TOWN BUILT IN THE HEART OF THE WILDERNESS BY THE CITY OF WINNIPEG.

This is for the purpose of handling supplies and material in the construction of [illegible] plant on the Winnipeg River.

heard of, on the continent at least, is the adoption by the large cities of Edmonton and Vancouver and by the coming metropolis of Prince Rupert on the Pacific, of the single tax on land values as a method of raising revenue. Under this system a vacant lot is assessed at exactly the same figure and pays the same tax as the lot next it, though the latter may be occupied by a building which cost $25,000.

In Edmonton certain modifications have been grafted on to the single tax. There each business is taxed on the basis of the ground or floor space which it occupies.

Meanwhile, the Dominion government, itself, is completing the construction, at public expense, of the eastern half of a new transcontinental railroad. And everywhere, from Halifax to Vancouver Island, the people as a whole are more and more taking into their own hands the ownership or control of the natural monopolies and public utilities of this northern empire.

WIRELESS AERIAL DESTROYER

By

J. HARTLEY KNIGHT

MR. THOMAS RAYMOND PHILLIPS, a consulting engineer of Liverpool, England, has invented an aerial apparatus whereby he can, he claims, control from any center, such as London or New York, an airship flying hundreds of miles away. Sitting at a transmitter he can send a dirigible balloon through the air at any height and practically to any distance: he can make it ascend or descend at will, turn to the right and left, go backwards and forwards, fast or slow, and—most important of all—can bring it to a standstill at a given spot, so as to drop explosives over a city, or an army or a battleship.

A large model of this terrible engine of war was recently tested in the London Hippodrome before a small audience which included Mr. Claude Grahame-White, the aviator who recently distinguished himself in his attempt to rival M. Paulhan in flying from London to Manchester for the $50,000 *Daily Mail* prize. The inventor of the aerial destroyer, which has been offered to the British government, claims that his principle can be applied as successfully to man-lifting airships and aeroplanes as he applied it to his model.

"I can sit in an arm-chair in London," he declared, "and make my airship drop a bunch of flowers into a friend's garden in Manchester, or Paris, or Berlin." As he said this his fingers wandered over the keys of a complicated electrical apparatus which suggested nothing so much as the keys of an ordinary typewriter. Every time he pressed a key there was a cracking noise and a lightning-like streak shot from each of two brass knobs towards a small metal globe that stood half-way between them. The model dirigible swayed gently in the auditorium until Mr. Phillips suddenly touched a lever. Instantly it stopped dead. The inventor touched another key and the dirigible came steadily down to within a foot or two of the operator. As the latter played on the keys before him, the destroyer rose and fell, turned this way and that, cut figures of eight and finally floated motionless in the air forty feet above the orchestra stalls. "Imagine," said the inventor, "that I am controlling a full sized airship with a cargo of dynamite bombs and that that row of stalls represents so many houses." He again touched a key. There was a click from the framework of the airship and the bottom of the box that hung amid-

THE AERIAL DESTROYER.

Raymond Phillips' wireless controlled airship. The inventor is seen beside the model. Mr. Grahame-White, the aviator, is facing the audience with his hands on the transmitter.

ships fell like a trap door and in so doing released not bombs, but a number of paper birds, which fluttered gracefully down "on the place beneath."

Mr. Grahame-White personally tested the invention and apparently proved for himself the unlimited possibilities of the principle of wireless transmission of power. "The two propellers in front," explained the inventor, "are for steering and general control. I use no rudder. The steerage propellers move on an arm pivoted at right angles to the frame. If I want the airship to turn to the right, I press the button connected with the motor of the right hand propeller. The propeller revolves, the arm turns to the right, and the body of the airship follows. Of course, I can keep it on a straight course with both propellers revolving as long as I like. To ascend or descend, I set in motion the two propellers fixed horizontally on the framework. The complicated structure in the middle of the frame is the wireless receiver and controller, and at the end of the frame are the accumulators. The frame is fitted with tiny electric light bulbs. By pressing another key I can light up the airship."

AN IOWA CORN FIELD AFTER THE MISSOURI HAS BROKEN THROUGH.

CLAIMING OUR INHERITANCE

By

ELRENE NISEWANGER

WHEN the Weary One protested tritely, "The world owes me a living, anyway," his adviser pointedly suggested, "But you are expected to do the collecting yourself," thereby voicing one of the universal laws of Nature. We, out here in one of the paradise spots in the valley of "The Big Muddy," after witnessing a monotonous recurrence of destructive floods, realized that we had collided with that same law.

When that big glacier plowed out the valley of the Missouri and deposited its cargo of richness, the general plan was perfect, but little errors in detail have since cropped up — oversights like the forming of too shallow beds for some of the Missouri's tributaries and a failure to contract with the elements not to fill these small streams bank-full just when the ice-gorged "Old Muddy" was backing water or running full and swift under pressure of a June rise. So it was that, although Mother Earth never offered richer farming country to her children, growing crops were insistently destroyed by overflows until it was made plain that, while the world was perfectly willing to give us a living, it would be necessary to devise a satisfactory means for collecting it.

It was in April of 1880 that the first big flood in the memory of present set-

tlers came. This was, in some respects, more extensive than any that followed; but it was because of its bigness that later ones have been a little less disastrous; opening, as it did, some new channels and digging some reservoirs that have partly checked the spread of later floods.

The Missouri bottom, in this region, is from twelve to eighteen miles wide, bordered on both the east and west by ranges of clay hills from one hundred and fifty to two hundred feet high. There is a legend among the Indians that these hills were at one time the "Big Muddy's" banks. That may or may not be history but at the present time the Missouri, with its myriad bends and sand bars, wends its irresponsible way through something like the center of this valley, in a bed probably less than a mile wide at its most extended point. On either side is a rich farming country somewhat cut up, particularly on the Iowa side where the trouble is, with tributaries of the Missouri.

Excepting the Little Sioux, the tributaries are small and very inoffensive looking during the most of the year; but it takes only a good rain to change those near the hills into angry little torrents viciously pouring their surplus over the lowlands, ruining crops with a diabolical regularity. The banks of the Little Sioux are high for some miles up from where it empties into the Missouri in Harrison County and the river is capable of carrying a large amount of water when the Missouri is normal. But it is not so well fortified farther north, and in Monona County has a treacherous little addition in the West Fork, so that a heavy rain in this region may at any time send the Little Sioux out where its banks are shallow, and is sure to do so if, at the same time, the Missouri is busy with a spring gorge or June rise so that it is backing, instead of receiving, water.

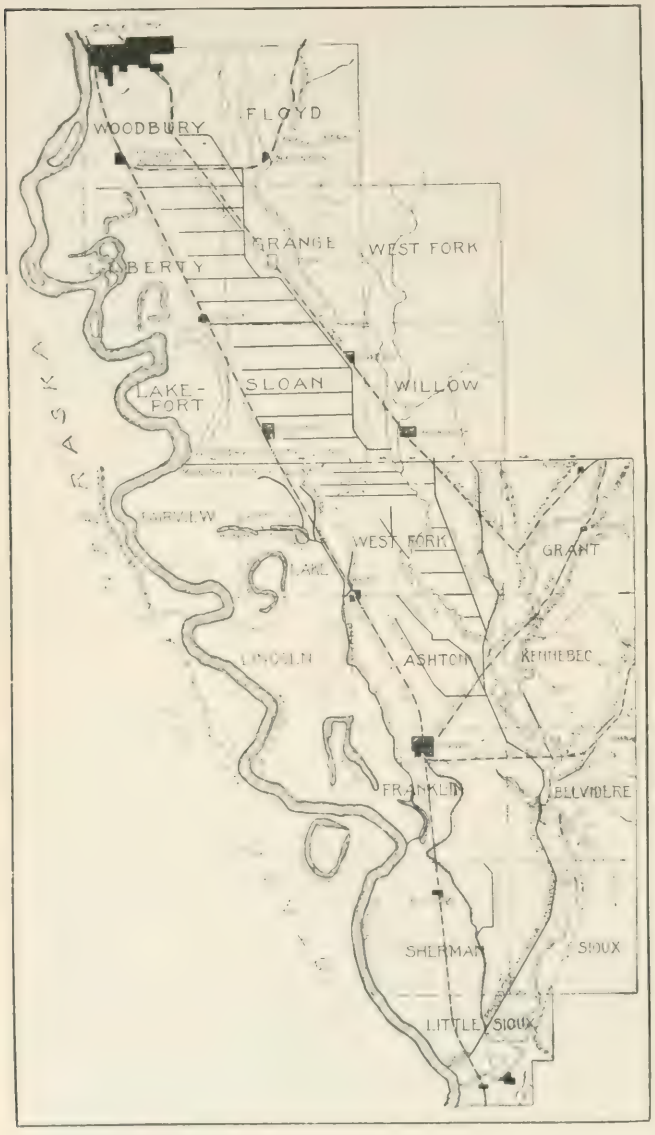
The flood of 1880 was caused by a series of warm days and warm rains that broke up ice and formed dangerous gorges in the Missouri. The river rose swiftly, backing into the Little Sioux and overflowing various draws and "lakes" that are either dry or cut off from the river at its low seasons; and the West Fork and Sioux were soon sending their contributions down across Monona and Harrison counties.

The tracks of the Chicago & Northwestern railway to Sioux City, built on a high grade, divided the flood. The Missouri backed water up the west side till people boated over fences and fished in last year's corn fields and rowed to town for their mail and groceries. But most of the overflow was held east of the track until it al-

"THE WASHOUT" DURING FLOOD
Showing damaged railroad track and wrecked wag[illegible]

most reached the Little Sioux where it angles to its mouth. Here a new outlet was found under the long railroad trestle and a portion of the flood swept through, transforming a level wagon road into a gullied waterway, tearing out a basin forty feet deep near the trestle and digging out a channel, now known as "The Washout," to the very waters of the main channel of Missouri River itself.

In normal seasons The Washout is simply a very pretty elongated lake, most attractive for fishing, boating or any sort of camping expedition, but it requires only a little surplus water a few miles north to change it into a fiend that has regularly put the railroad trestle out of commission for the time being and ruined or greatly impaired a wagon bridge just west of it. The huge pilings of the trestle catch the debris wrenched from fields, fences and farmyards and the force of the dashing, eddying water has more than once thrown the track above out of line. And yet the railroad company demanded and secured heavy damages from a long-suffering county when it began the undertaking which, if even partly successful, will be the salvation of the company's property at a point which has, for thirty years, been its heaviest contributor to the repair column.



MAP OF MONONA AND WOODBURY COUNTIES, IOWA, SHOWING HOW THE MISSOURI RIVER HAS ENCROACHED ON THE LAND AND HOW THE DITCHES WILL KEEP IT OUT.

The patches of water [illegible] are the lakes in flood time. The white region is low and subject to inundations.

For, after a respite of ten years, a second and very destructive flood came in the spring of 1890, followed by several others at much shorter intervals. It was only three years later that there was a cloudburst in Cherokee, three counties north, but on the Little Sioux. Immediately a torrent swept the whole valley, gullying the soft places and forming "Gumbo River," a new tributary to the Little Sioux. Financial losses were much heavier than those resulting from previous overflows since the country had, in the meantime,

GUMBO RIVER—THE FLOOD'S GIFT TO THE FARMER.

became quite thickly settled. What had been open prairie was now cultivated farms with crops to be drowned out and homes to be wrecked. So swiftly did the water come that many had to leave their homes in boats, while live stock tried to swim to safety. It was no unusual thing to see chicken houses floating by with their inmates clinging desperately to the roofs, and hogs fiercely resisting the current and trying to swim against it. In the years since then, the country has been visited by more or less disastrous floods at irregular intervals.

The donation of rich soil left by the floods came at a too great cost of peace of mind and ruined crops. Farmers were becoming pauperized and the land market terrorized. They must be stopped by some means.

It had become evident that the natural course of the surplus water on the bottom lay irregularly through various small lake beds, with an outlet to the Missouri by way of The Washout. In an effort to solve the drainage problem the Little Sioux was cleaned out and several cut-offs made to straighten its channel and increase its carrying capacity, and a system of ditches was devised, surveyed, and is being carried out for these purposes at the present time.

Not without protest, however, is the plan being worked out. Ever since the days of the almost worthless little county ditches—now nearly filled with dirt and decaying corn husks—the courts have fattened on law suits of various descriptions.

Ditch taxes are very high and some tax payers resist the ditches on this account, thinking the benefit will not offset the outlay; while others consider the whole system a mistake, holding that the rivers should have been diked, confining spring freshets, donations from cloudbursts and the like, to the natural waterways instead of cutting up a rich farming country with main ditches and laterals until western Iowa more nearly resembles a checkerboard than a respectable agricultural state.

The dike adherents, however, were overruled and the great ditch that is to drain four counties is scheduled for completion before the end of the ditching season of 1910.

Several large contractors, each with more than one boat on the scene, and other smaller companies, have helped with the work; and some have gained more experience than wealth in their

A PORTION OF THE FLOODED VALLEY EAST OF THE RAILROAD GRADE.

tussle with the gumbo of the Missouri bottom. Perhaps chief among these makers of modern geography are the Calahan, Shea, Crane and Ferris-Kesl companies. Calahan, the pioneer dredgeman and largest contractor in the West, dug what is known as the Woodbury-Monona ditch north to Sioux City, several laterals, and a temporary ditch along the surveyed route from Jenning's Lake in Monona County to The Washout in Harrison, to carry off surplus water and relieve adjoining lands before completion of the ditch. F. M. Crane, now of Omaha but formerly of the flooded district itself, with a personal and intimate understanding of the condition and needs of the region, with two of his dredges in the field, has several contracts successfully completed and others in process of completion.

Shea, of Chicago, has had much to do with the construction of the Monona-Harrison ditch—the climax of the system—having dug it entire from the West Fork to Oliver lake in Monona County and continuing with two boats ahead of the monster Ferris-Kesl dredge which is completing the project. One of the Shea dredges is coming down Calahan's temporary ditch just ahead of the Ferris-Kesl, taking off seven feet of dirt, the other began at The Washout and is digging north. When they meet their work will be done and they will make way for the Ferris-Kesl, the second largest inland dredge in the world, which is to continue through The Washout and straight on to the Missouri, leaving behind it a ditch seventy-five feet wide and fourteen feet deep.

Night and day this dredge eats its way through the sod and firm, black soil, depositing its endless stream of mouthfuls on both sides of the ditch. While this dredge is distinctly a boat and must have enough water to float it, it needs none ahead and had none from the time it left Oliver Lake until it struck the Calahan ditch out from Jenning's lake.

DREDGE BOAT ON THE CANAL.

For many months, now, it has been possible to stand in any one of numerous townships and see the smoke of three or four dredges by day and their search-lights by night. These great machines, with their piercing lights, have seemed almost uncanny in their power and scope. Whether they are demons or gods must be demon-

strated by what the future will bring forth.

Just now, to Harrison County, the proposition sounds very much like a "It may be nice for Mary Ann but it's mighty tough on Abraham," story, being crossed by an uncompleted ditch that is to drain three counties and form an outlet for the treacherous West Fork at high water. The residents, although taxed very heavily, feel that their present farming chances are considerably below par and their future not guaranteed. Given a full ditch and a low Missouri, results might be entirely satisfactory; but given the full ditch and a level or water-backing Missouri—

SAVING A CITY'S SEWAGE

By

HARRY H. DUNN

COMPLETELY deodorizing 500,000 gallons of sewage per 24-hour day, killing all bacteria, and leaving a limpid liquid carrying an inconsiderable sediment of iron salts, a plant now in operation at Santa Monica, California, has answered the disposal-of-sewage problem, with which so many cities have struggled ever since they outgrew the village stage.

Direct irrigation of farms with untreated sewage has been found to be disagreeable and dangerous to human life; the deposition of the original sewage in the sea or in rivers by its odor ruins surrounding country for residence purposes; septic tanks are proven failures, Berlin alone having spent $2,000,000 in a futile effort to dispose of its sewage by chemical and septic methods.

After the treatment accorded the sewage of the 11,000 inhabitants of Santa Monica, however, the result is a colorless, odorless liquid, still containing nitrogen and other elements which make sewage particularly valuable for irrigation in even greater quantities than available in the original waste.

And the key to the problem? The same key which sends your words and mine over hundreds of miles of singing wires; the same key which reproduces Caruso's voice in your parlor or in the penny arcade downtown, draws the wireless message from high heaven and sends the thundering trolley train on its way—Electricity.

Some one discovered a long time ago that electrodes, sunk in water, performed a chemical action by which "nascent" gases, such as chlorine, oxygen, ozone and hydrogen are released. These gases, in the nascent state, act powerfully and quickly on organic and inorganic salts occuring in the liquid, either in solution or as sediment. Likewise, these newly-released gases start a never-ending war on all bacteria in the liquid. The result is evident, the sewage is, under all circumstances, rendered "neutral," which is to say that neither free alkalies nor free acids are contained in the treated liquid in excess, but are held chemically combined, in the easiest form possible for their application to soil and their absorption by plant life.

The outfall end of the main collecting sewer of the city of Santa Monica discharges into a pump chamber at the shore end of the sewer pier, the outfall pipe line having been laid years ago along the beach instead of on the bluff, as should have been done. This pump chamber is four feet above mean tide, and from it the sewage, in its original condition, is raised by means of electrically-operated centrifugal pumps to the forebay of the electrolytic plant.

From the forebay the sewage is dis-

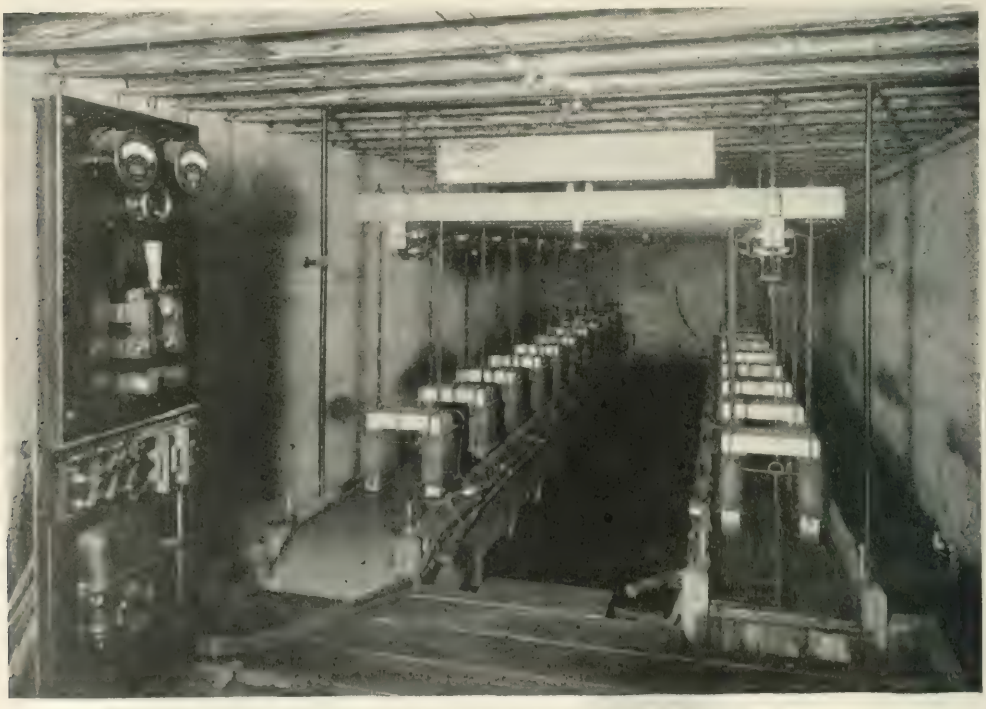
charged into either or both of two redwood flumes or troughs, each thirty feet long by twenty-two inches wide by eighteen inches deep, set on a gradient of one inch to thirty feet and placed side by side, with a working space between.

Each flume is equipped with ten sets of electrodes, spaced thirty-two inches apart, center to center, and operated in parallel. Each electrode set consists of twenty-nine plates, twenty-four by nine inches, spaced five-eighths inch center to center. Rags and extraneous things are arrested by baffles, and removed from time to time.

In the passage of the sewage through the centrifugal pump, the other solids are reduced to small particles very suitable for electrolysis. As but few sewage treatment plants can be so situated as to admit of operation entirely by gravity, this desirable pump feature would rarely call for extra or especial treatment. The end board at the discharge end of each flume is fitted at top with an adjustable weir plate to regulate the water to desired height in the flume, and at the bottom with a light wooden flap gate, extending full width of trough for washing out purposes. The discharge over the weir falls into the open end of the outfall pipe.

The electrodes as first installed consisted of alternate plates of iron and aluminum; these plates were decomposed very rapidly, having a useful life of only three weeks. The cost of replacement at such brief intervals would have proved prohibitory to the use of the plant. All iron plates of No. 8 gauge were then substituted at very substantial gain in durability.

The plates, however, still showed undue tendency to decomposition along the upper edges. Experiments were then made to protect the upper edges by U-shaped copper clips or bindings of number twenty-eight gauge, three-fourths inch deep, extending the entire length of each plate, tightly pressed or squeezed on, to give good contact. This experiment was very successful, good protection was given to the edges of the plates, at the same time a more uniform wear was observable over their entire surface. All the plates are now fitted



ELECTROLYTIC SEWAGE TREATMENT PLANT AT SANTA MONICA, CAL.

in this manner. Incidentally, the copper strips, in their decomposition, yield copper sulphate and aid in the treatment.

With the aluminum and iron plates there was a heavy deposition of solids upon the plates; with the all-iron plates, this deposition has not been so heavy. Here arose another matter which has given a very interesting discovery to all users of electrodes in decomposition work: The cleaning of the plates was first done by a man armed with a metal scraper, the original installation plan of perforated steam pipes for this purpose having proven somewhat faulty, but the cleaning is now effected in a simple and inexpensive manner by reversing the current every twenty-four hours, the anodes becoming the cathodes, and vice versa, alternately. As the solids are attracted and held by the poles opposite to themselves in electrical character, it follows that they are repelled and fall off on a reversal of polarity. With the addition of an occasional washing of the plates, using for that purpose an ordinary garden hose, this reversal of the current is found to keep the plates clean and in good order.

SAMPLES OF SEWAGE.
Showing, from right to left, purifying effects of treatment by electrolysis.

The arresting of all decomposition of the plates is not sought, for the dissipation of the iron by gradual electrical decomposition is an aid to the breaking up of the sewage. Indications from operation of the plant up to the present time are that the consumption of iron will be at the rate of about twenty pounds for every million gallons of sewage treated, or an average of about ten pounds of the metal every twenty-four hour day. The loss of copper in the binding strips is about one-third of a pound for the same time and same amount of sewage treated.

It should be noted here that the voltage of this plant is 1.8, and the amperage 500. In 1907 the El Paso and Southwestern Railway Company, made an experimental electrolytic treatment of water for locomotive use, with a voltage of 112 and an amperage of 200. The result was a loss of 6,630 pounds of iron for every million gallons of water treated, 331½ times as great as the loss in the Santa Monica sewage works. It would seem then, that the inventor of the electrolytic treatment used here, had solved another problem—the waste of electrodes—by the use of low voltage and high amperage, as against high voltage and low amperage.

Expense is a large factor in the operation of municipal as well as private utility plants, and it appears that this, too, has been solved by the electrolytic treatment of the sewage. The cost for electricity is about $1.50 per 24-hour day, or $3 per million gallons treated, the electricity being bought from the local power company. Any rancher on whose land the treated sewage could be flowed would gladly pay twice this rate for the liquid after it had been through the plant.

This electric bill includes, of course, the electricity used for running the pumps to lift the untreated sewage from the tank to the forebay. A gasoline engine could be used, at much less expense, for this purpose, and in that case the only cost of electricity would be for feeding the electrodes. The man who operates the sewage pump looks after the electrolytic troughs as well, without loss of time from his duties in the pumping plant.

The whole problem of sewage purification lies in the provision of economical and efficient means for the removal of the solids, whether such matter be immediately or successively deposited, and whether such matter is particulate or colloidal. The object and aim should be to produce an inodorous precipitate, fit to be spread upon land, and to lie there indefinitely without danger of putrefaction or other nuisance until ploughed into the ground.

This problem is met and solved by the Santa Monica plant. The precipitation of the organic matter by the ferric hydrate formed at the electrodes, as an inodorous coagulum, is immediate and complete. The precipitate in floculent, easily carried off in the liquid and very different from the slimy sludge produced by bacterial or septic-tank treatment. At Ocean Park, near Santa Monica, where a similar plant was located, the effluent was run out on the ground and remained there for a number of days without sign of putrefaction or fermentation, and with absolutely no odor.

It should not be understood that the purification of the sewage is caused by the direct action of the electric current. It is not, but proceeds from the electrolyte and from the decomposition of the electrodes.

The organic matter contained in the raw sewage is composed of albuminates, starch, sugar, uric acid, urine, nitrogenous compounds of organic constitution, fatty acids and bacteria. By the chemical action induced by the electrodes these organic products are reduced to a very small amount, leaving no traces of albuminates and nitrogenous bodies, which, in the septic tank treatment, are chiefly the cause of a secondary fermentation of the effluent, a state most dangerous for future infection when used on irrigation fields.

Microscopical examination of sewage treated by the Santa Monica plant showed a decrease from 700 live bacteria before treatment to six afterwards, and those remaining showed no signs of multiplying, and, therefore, were completely destroyed by the nascent oxygen or ozone generated by the electrochemical process.

Bacteria, such as bacillus coli communis, bacillus subtilis, bacillus cavi cida and bacillus urae, together with the dreaded typhus germ, all found in untreated sewage, are completely destroyed by the electrolytic treatment, while the free sulphuric acid formed also carries death to the cholera bacteria which are first found in the sewage of an infected district.

In the Southwest, where there is use for every drop of water, the electrolytic treatment of cities' sewage, if everywhere as successful as it has been at Santa Monica, is of even greater importance than anywhere else in the world, for all the effluent from the troughs can be flooded on the land, without the slightest danger to those who consume the products of the soil so irrigated.

At Santa Monica, inasmuch as it is a seaside city, the treated sewage is now run out 350 feet on a wharf, and poured into the ocean; for a number of months the end of the outfall pipe was only 150 feet from the shore, but no bad odors were noticed. As soon as the wharf now building is completed, the sewage will be carried out 1,600 feet before being dumped.

BOYS BECOME MANUFACTURERS

By

M. M. HUNTING

IN the city of Dayton, Ohio, six boys invested two dollars each from their savings and formed what is known as the Juvenile Manufacturing Company.

A playhouse in the back yard of the home of one of the boys was remodeled for the factory, and the company elected a president, vice-president, secretary, and treasurer and a board of directors

They began turning out wooden waste paper baskets, of the mission style, and tabourettes such as are made in most manual training schools, but later on as business increased they had a few articles in art bronze manufactured for them, which they include in their stock of bric-a-brac.

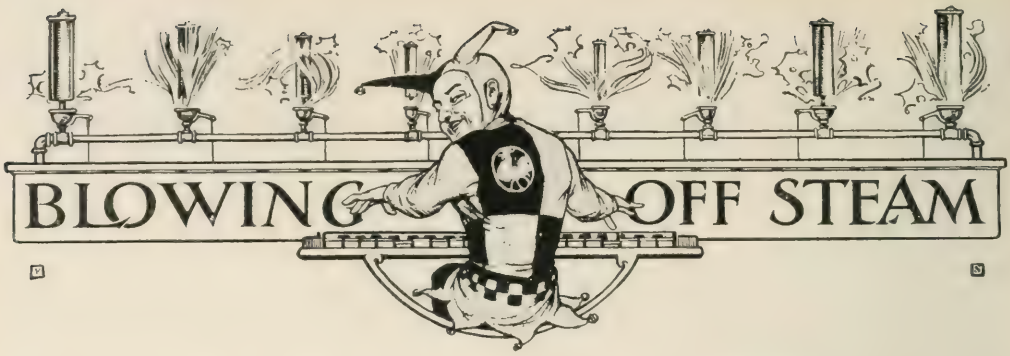
These boys have not only been successful in selling their products in their home city but in many other cities as well, through the circulation of a very neat little catalogue.

The capital stock of the company was placed at $25.00 and in one month after starting work they declared a one hundred per cent dividend, and prospects for future business looked exceedingly bright. The bank balance, from the latest report, was $150.00.

The work so far has been done entirely by the officers and board of directors of the company, with now and then a suggestion or two from some of the parents, but it is planned the coming year to employ an instructor from the local manual training high school who, it is expected, will make arrangements to increase the variety and quantity of the output.

Through the advertising the company has done and the novelty and originality of their designs considerable interest has been aroused in all parts of the country and the president has been quite overwhelmed with letters of inquiry regarding their plan of organization and the results. It is just this sort of work that keeps boys in school longer than they otherwise would stay there, for they find real live interest in the making of practical things. Then, too, it encourages the parents to keep them there. Moreover such work trains them in industry and self-reliance. No one who has early in life acquired this power will be found later in the ranks of the downtrodden "wage slaves."

THE ENTERPRISING DAYTON OHIO BOYS WHO [illegible] BUSINESS OF THEIR OWN



Certainly Not

CENSUS TAKER—"How many children have you?"

CITIZEN—"Three."
CENSUS TAKER—"Altogether?"
CITIZEN—"No; one at a time."—*Life.*

Retort More than Courteous

AT a dinner party a lady whom Archbishop Ryan had been chaffing thought she saw her opportunity and his dessert.

"A fig for you, your Grace," she remarked pointedly, passing him a plate of figs in their leaves. Her waist was cut very low in the neck.

The Archbishop only smiled politely, and taking a leaf from the plate said: "A fig-leaf for you, Mrs. X."—*Ladies Home Journal.*

Not If She Knows It

"I COULD be happy with you in the humblest cottage," he declared.

"Maybe you could," she replied, "but you won't."—*Chicago Record-Herald.*

The Odor Distingué

PEDDLER (selling a bottle of scent to a cook)—"Now, what would you like to smell like, a duchess or just a baroness?"—*Fliegende Blatter.*

Took Peoples Course

VILLAGE CONSTABLE (to villager who has been knocked down by a passing motor-cyclist)—"You didn't see the number, but could you swear to the man?"

VILLAGER—"I did; but I don't think 'e 'eard me."—*Punch.*

Wisdom

THE DOCTOR—"How is your appetite?"

THE PATIENT—"Wretched; the best meal my wife cooks doesn't tempt me."

THE DOCTOR—"Um—er—er—do you ever try a meal in a restaurant?"—*Chilicothe Herald.*

Others Like Him

MRS. LOREN YET—"He has good blood in him."

MRS. HUGH MAY—"But how admirably he conceals it!"—*Life.*

Located

IN Zanesville, Ohio, they tell of a young widow who, in consulting a tombstone-maker with reference to a monument for the deceased, ended the discussion with:

"Now, Mr. Jones, all I want to say is, 'To My Husband' in an appropriate place."

"Very well, ma'am," said the stone-cutter.

When the tombstone was put up the widow discovered, to her amazement, that upon it were inscribed these words:

TO MY HUSBAND. IN AN APPROPRIATE PLACE.
—*Harpers.*

Most Excellent Reason

IT was a gala occasion at the school, and the young lady principal was very anxious that her pupils should show off to the best advantage before the many ladies present.

So to the first scholar she said:

"Now, Grace, where was Mary, Queen of Scots, born?"

"At Linlithgow," answered the pupil.

"And why was Mary born there?" asked the teacher.

And sweet little Grace promptly answered:

"Because, ma'am, her mother was staying there."

Conscientious Man

A CERTAIN English mayor, whose period of office had come to an end, was surveying the work of the year. "I have endeavored," he said with an air of conscious rectitude, "to administer justice without swerving to partiality, on the one hand, or impartiality on the other."—*London Daily Telegraph.*

Milk-Table Gossip

MRS. TABBY—"It is rumored that your husband Tom is living a double life!"

MRS. MALTESE—"I'm afraid that he's living eighteen of them!"—*Harper's Weekly.*

Lucks Man

"I WILL never marry now," said the rejected suitor. "Why not, pray?" she asked. "If you won't marry me, who will?"—*Buffalo Express.*

Providential Escape

THE old lady had had a severe illness, and she was relating its vicissitudes to a friend or two in the grocer's shop when the minister

came in. "It's only by the Lord's mercy," she piously declared, "that I'm not in heaven to-night."—*Manchester Guardian.*

Mother Knew

DAUGHTER—"Mother, could I love two men at the same time?"

MOTHER—"Not if one of them gets wise."—*Princeton Tiger.*

All Invisible

CURATE (to lady who has taken refuge in ditch)—"Didn't I assure you that a cow is only dangerous when it has lost its calf?"

SHE—"That's why I was frightened. I couldn't see a calf anywhere."—*Punch.*

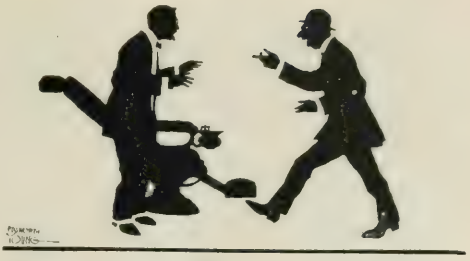
A Warning

LOVE'S young dream appears to have met with an interruption somewhere, judging by the following pathetic warning ad, in the Auckland *Herald* of a recent date:—"O. D.—No; father's home.—V. R."—*New Zealand Free Lance.*

Couldn't Fool Her

LITTLE GIRL—"Look, auntie, there's a poor man with a wooden leg. Can't I give him a penny?"

AUNT—"Certainly not, dear. I have no doubt he's an impostor."—*Punch.*



Pluck

"DON'T spend no money for gas," he told the dentist. "Yank it out if it does hurt."

"You are plucky," said the dentist. "Let me see the tooth."

"Oh, 'taint me that's got the toothache; it's my Wife. She'll be here in a minute."—*Cosmopolitan.*

At the Party

BARKER—"Who's the fat old girl on the sofa?"

HOST—"Why, that's your wife, old man. Don't you recognize her?"

BARKER—"No. She does her bridge playing during the day and I do mine at night."—*Life.*

An Informal Affair

"WHY, Auntie, have the magazines upset you?"

"Well, I've got through the advertisements, and I feel exactly as if I had been to a party where all the men came in their underclothes and the ladies wore only corsets."

Circumstances Alter Cases

EMPLOYER—"Come here, young man. I understand you've been gambling in rubber shares."

CLERK—"Yes, sir. I made £120 last week."

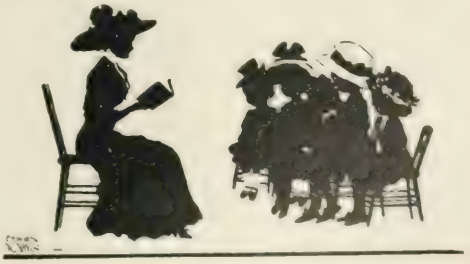
EMPLOYER—"Great Scott! Do you know anything else?"—*London Opinion.*

Abrahams Predicament

THE Sunday-school class had reached the part in the lesson where "Abraham entertained the angel unaware."

"And what now is the meaning of 'unaware'?" asked the teacher.

There was a bashful silence; then the smallest girl in the class piped up, "Un'erware is what you takes off before you puts on your nightie."—*Lippincott's.*



A SOUTHERN CALIFORNIA APIARY DURING THE WINTER MONTHS.
This is the season when vegetation is at its best.

A WINTER RESORT FOR BEES

By

C. L. EDHOLM

IN order to escape the severe winters of Utah, three carloads of bees were shipped to southern California last December to enjoy the mild climate of San Bernardino. This original experiment was carried out by N. E. Miller and J. T. Hale, going on the theory that the bees would not only avoid the severe weather of their native State, but that the size of the traveling apiary would be doubled.

County Bee Inspector R. B. Herron reports as follows: "This end of the deal has been a great success so far, as there is no place in the United States that can beat it for early breeding of bees."

The road used for the purpose suffered in a severe washout last winter and was long in being placed in commission. This was an unforeseen catastrophe which diminished the profits of the venture, as after two carloads had been sent through by the Salt Lake route the third car was stranded in about two feet of snow on the wrong side of the break and consequently had to be sent around by the Union Pacific at a cost of over $500 for the car. Besides this, the three weeks' delay and the bad weather *en route* had resulted in the loss of many bees. In spite of these drawbacks the experiments may be called a success and the enterprising apiarists are prepared to repeat the excursion every year.

Under ordinary conditions the cost of shipment is about $187 per carload of four hundred stands, and by wintering in California and returning in the spring to the honey fields of Southern Utah which are exceedingly productive in bee feed, the expense will be more than covered. Thus the bees are kept busy the year round.

POPULAR · SCIENCE & MECHANICS SUPPLEMENT ·

LIZARD GOOD TO EAT

ONE of the most remarkable and interesting reptiles in the world is the iguana, which is much esteemed as a table delicacy in tropical America. It often reaches a length of five feet.

The animal seems to be a sort of survival from a very ancient epoch—a leftover descendant of that race of giant lizards which ruled creation some untold thousands of years ago. There are at least five species of iguanas, the one that inhabits the island of Hayti being somewhat different from the Cuban species, and so with others. But all of them are very attractive animals, and suitable for pets, being quite harmless.

The species shown in the illustration is reported to be edible and certain of our tropical American friends are said to enjoy him greatly as a table delicacy.

LIZARD THAT IS GOOD TO EAT
Delicacy which tropical Americans relish

IMMENSE IRRIGATING WHEEL

IN some parts of northern California there are sections that can be rendered very fertile only by the addition of water. There are as yet no government reclamation projects in operation, in such districts, on any scale, however small, and the settlers, and land owners have to rely upon their own resources to improvise adequate irrigating facilities. Especially is this the case along the narrow valley of the Klamath River where it flows through Siskiyou County.

Along that stream have been placed a number of "irrigation wheels" that, in the aggregate, furnish an adequate supply of water for all kinds of crops—grains, grasses, orchards, vegetables, etc. The accompanying photograph shows one of these big irrigating wheels in full operation.

BIG IRRIGATING WHEEL.
One of the many devices for watering the land in our dry regions.

Generally, these wheels are about eighty feet in diameter, and are strongly built of wood. Along the outer circumference are placed "float boards," or paddles. The wheel is immersed several yards in the water and the impulse of the current keeps the huge wheel slowly revolving all of the time. Placed at the interval of every few yards on the outside of the wheel, are large box-like metal buckets. These are filled as they dip into the water, are hoisted by the revolving wheel to the top and the contents poured into troughs on each side. These timber water flumes lead into ditches dug along the steep banks of the stream. Many of these ditch-flumes are miles in length.

As these wheels run perpetually great stores of water are thus collected and distributed among the thirsty crops of the ranchers for leagues on both sides of the narrow winding Klamath River Valley.

The only expenses to the enterprising ranchers is the construction of these wheels, and the digging of the irrigating ditches. The "system" furnishes its own power as well as the life-sustaining element at the same time.

When once in motion, these wheels revolve indefinitely without attention.

AUTO PULLS ITSELF OUT OF DITCH

THE problem of extricating a heavy automobile from sandy or wet ground, which gives no purchase on a steep grade, has been solved by a western automobile driver, Mr. L. A. Nares of Fresno, California.

This is accomplished by means of a device like a capstan on the hubs of the rear wheels of his car, and with aid of a block and tackle and five hundred feet of rope. Using the power of the engine, he is able to pull his car out of tight places which would put ordinary automobiles out of commission. This is a feat which might be likened to lifting yourself by the straps of your boots. This device is of especial value to automobile travelers who take long trips in desert and mountainous regions.

The car used by Mr. Nares is fitted up for just that purpose as he is constantly traveling between San Francisco and Los Angeles by various roads.

AUTO EFFECTS ITS OWN RESCUE.
Effective means by which the motorist escaped an awkward predicament.

AUTOMATIC STENOGRAPHER

WITH the exception of the thinking necessary on the part of the author, everything else in connection with preparation of a manuscript nowadays may be purely mechanical. With the perfection of a new device that has just been patented the author of the future will merely talk his ideas into a tube, and machinery, entirely unaided by human hand, will do the rest.

This wonderful device has been perfected to a point where it will produce typewritten letters continuously, each one separately written, at the rate of from 5,000 to 10,000 words an hour, and never grow weary of the task. A further improvement upon it that is being experimented with at the present time, will make it possible merely to dictate and permit machinery to do everything else with the exception of handing the letters to the government mail collector. .

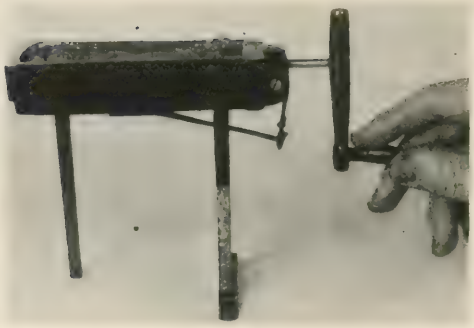
While this device has been proved to do all that the inventor claims for it, yet it cannot be said to be a competitor for the stenographer just yet. The dictation feature is a somewhat crude affair and has never been carried to a point where it has actually produced any results that can be claimed to place it in the class of marketable merchandise. However, it does show that work is being done along this line, and who can tell but that some day it may be perfected to a point where it will be introduced into every business office in the world?

A STAGE PENQUIN AMONG REAL PENQUINS.
Miss Rita Leggiero, an actress as a penguin in her stage dress, giving a fish to one of the birds.

AUTOMATIC TYPE-WRITER, SHOWING WORKING PARTS AND COMPARATIVE SIZE.

The machine actually writes letters in any quantity, being operated by electricity, and will produce circulars in a most remarkable manner. It is known as the "Automatic Typewriter" and has been exhibited at the annual Business Shows. It is unique in its accomplishments and produces letters, written a character at a time, changing the name and address, salutation and signature, writing in one, two or three colors, single, double or triple space, changing as often as it is desired, and performing the whole task very much faster than the fastest stenographer with the additional advantage of there being no possibility of error.

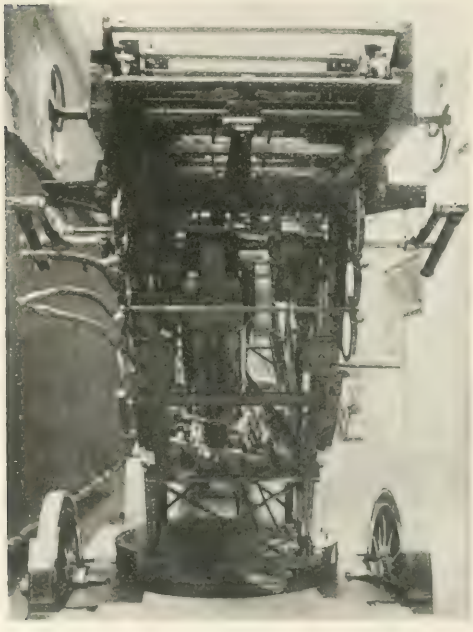
The actual writing portion of the machine is no



The First Clothes Wringer.
From a model in the patent office.

different from any typewriter; in fact any standard typewriter can be used in connection with the device, with the addition of a few parts and some slight changes in the mechanism. The ordinary typewriter is placed over a box or on a stand that in every way looks like the most common style of typewriter table. Above the writing machine is a "feed board" upon which the paper is placed on which the letters are to be written. Leading from this is an inclined plane. Compressed air separates the individual sheets of paper, and a pair of fingers raise a single sheet at a time, force it forward to the edge of the plane. Here it is seized by a pair of conveyors that carry it to the back of the typewriter platen in exactly the same manner in which a girl would do it. Just before it strikes the platen the fingers move up and down, forcing the letterhead into a perfectly straight position. As soon as it strikes the platen, a whirr and buzz is heard. The sheet is carried quickly down, around the platen, the head coming up in front, exactly as if a girl were doing the operating. When the proper point is reached where the writing is to begin, the buzz and whirr ceases and, quicker than thought, the actual working of the machine begins. The keys travel over the paper so fast that it sounds like the clicking of a telegraph instrument that had gone wild. The sound is the same as any typewriter would make, but the frequency of strokes is so much greater and more even that it resembles a dozen typewriters all working top speed at the same time. The work is perfect in every particular. The machine spaces accurately and shifts from right to left or left to right as required. With this machine perfected, there will be little left for human hands to perform so far as work in offices is concerned.

Looking Up at One of the New Turntable Ladders of London.



A Wonderful Piece of Mechanism.
The front of the new turntable fire ladder recently acquired by the fire department of London, England.

London's New Combination Turntable Ladder and Water Tower.

PRIMITIVE MODE OF TRAVEL STILL IN VOGUE IN THE PHILIPPINES.

PHILIPPINE RAPID TRANSIT

MANY primitive customs still exist among the different races which inhabit the Philippines. It would be difficult to find a mode of transportation as simple as the one illustrated by our photograph, except perhaps in certain mountainous districts of Colombia, where travelers sitting in a sort of basket are carried on the backs of Indians long distances through the country. This sort of carriage-sledge, a vehicle without wheels, is used also in the Canary Islands and among the Zulu tribes of Africa. In China one finds a vehicle similar to this which is used for transporting either travelers or merchandise.

A "MONEY-BAG" SIX THOUSAND YEARS OLD.
A Chinese purse of copper and silver.

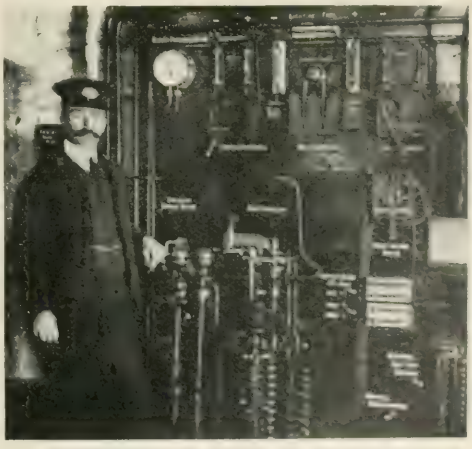
In many instances the soil and condition of the climate seem to have imposed this mode of transportation. Where the ground is very wet, and this is the case in the Philippines because of frequent heavy rains, roads and pathways are sometimes transformed into flowing mud, where draught-beasts, vehicles and travelers are frequently engulfed. This danger is lessened by the use of the carriage-sledge, its weight being distributed.

As primitive as may appear the equipage of the Philippine peasant, one may notice certain details which are quite complete. The box furnishes a sort of balustrade which gives support to the occupants. Above the runners, which are formed by the extremities of the shafts, two pieces of wood project outward touching the ground assuring great stability in dangerous places. The enormous bovine which serves at the same time as draught-beast and animal for riding, represents a domestic variety of the buffalo caribou, remarkable for its skin being entirely destitute of hair, and for the extraordinary development of its horns.

Wild caribous still multiply in the Philippine jungle; hunting them is considered more dangerous than a tiger hunt.

AN ELECTRIC TRAIN ON A BOARD

THE remarkable device by which the English District Railway's motormen are taught their work is shown in the accompanying illustration. The board is fitted with every lever, fuse, and other detail of an electric train, and matters are so arranged that the resistance offered by these levers, etc., is the same as that offered by them when fitted to a train. The motors, alone, do not appear on the board. They are represented by a cluster of lamps, which are lit by the power which, in practice, would drive the motors. Each electric train on the District Railway carries not only its regular driver (motorman) but a head guard who is a qualified driver.



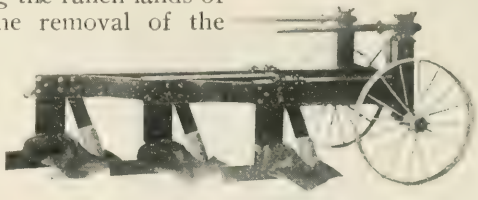
A STATIONARY ELECTRIC TRAIN FOR TEACHING MOTORMEN.

Two Hundred Bags of Grain at a Load.

ROOT-GRUBBING PLOW

ONE of the expensive difficulties met with in reclaiming the ranch lands of southern Texas is the removal of the roots of the mesquite trees from the ground. These trees are low of stature but they grow thickly and their roots almost form a mat under the surface. Upon the smaller tracts it is the general practice to remove the roots by means of grubbing before the raw land is broken with the plow. It was found that where many thousands of acres in a solid tract were to be reclaimed in one season the old process of hand-grubbing was slow and expensive. In order to overcome this difficulty a peculiar combination plow and root-grubber was invented and is in practical use upon some of the larger ranches. The mesquite trees and brush are cut off near the ground. The new plow and grubber is then hitched to a traction engine, usually in gangs of six to twelve plows. In front of each plow share is a strong and thick sharpened blade which cuts the roots, the severed pieces being lifted to the surface. The plow performs its work without a hitch, and it is claimed by men who have used it that it greatly reduces the expense of reclaiming the land.

This root-grubbing plow is probably the very latest in reclamation machinery and will doubtless do much toward opening up the ranch land of Texas.

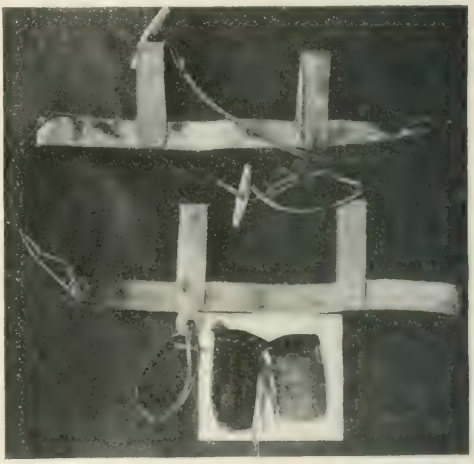


Combination Plow and Root Grubber.

WELL-LOADED STEAM TRACTOR

THE accompanying illustration shows an English steam wagon with trailer handling a load weighing about eight tons which was hauled a distance of ninety miles. This steam car is carrying two hundred bags of grain from an English mill, while the trailer carries eighty bags or about three tons. The tractor operates at a normal speed of from five to eight miles per hour, the engine and boiler being covered by a cab on the front of the tractor, as indicated in the illustration. A number of these cars are in operation throughout England for moving furniture and for brewery service.

The commercial steam vehicle has not been developed to any extent in this country and is far from being a factor of much importance in this field. The steam tractor has been developed in Great Britain at the expense of the gasoline type up to within a few years ago. These steam cars, which are employed both in the form of trucks and tractors, are not far from the road roller, in some instances.



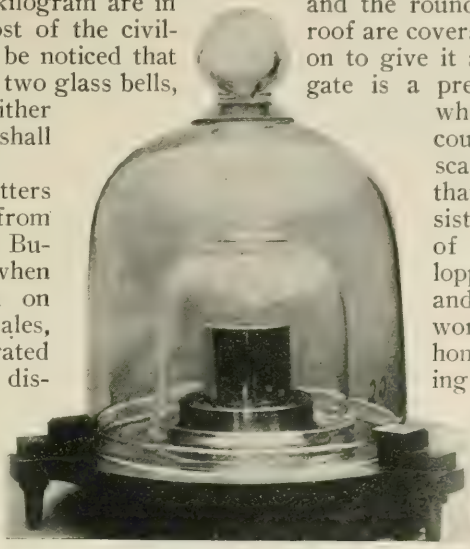
Dog Harness to be Used on the Siberian Sledge Dogs.

Two shoes of reindeer skin which are used to protect the animals' feet when sore and bruised by rough ice travel.

STANDARD OF WEIGHT

THIS is the standard kilogram. It is the only scientifically recognized standard of weight, and is kept at the Bureau of Standards, in Washington. Exact copies of this kilogram are in the possession of most of the civilized nations. It will be noticed that this one is kept under two glass bells, in order that neither moisture nor dust shall get at it.

How exact such matters are may be judged from the fact that, at the Bureau of Standards, when objects are weighed on the more delicate scales, the latter are operated from a considerable distance, in order that the heat of the body of the operator may not affect them. The standard kilogram weighs 2.2046 lbs.



THE STANDARD KILOGRAM AT THE BUREAU OF STANDARDS, WASHINGTON.

QUEER HOME OF A RANCHER

THE home of one Arizona rancher is situated in a part of the country that is visited by fierce wind storms, and to prevent the roof of the house from blowing away the owner adopted the novel plan of suspending large stones from the corners. It will be observed that one of these weights was bored, with infinite patience, so as to take a few strands of bailing wire. It was found necessary to pile stones on the roof of the lean-to after the fashion of the Swiss chalet.

The ornament over the door which resembles a horse shoe is in reality a pair of horns, while the stuffed animal is a "bob-cat," shot while making a raid on the rancher's sheep.

The house itself, is of adobe, the accepted building material of the Territory, and the round ornaments along the roof are covers of lard buckets nailed on to give it a fanciful touch. The gate is a pretty good example of what can be done in a country where lumber is scarce. It will be seen that the gate proper consists of only four pieces of wood, rough branches lopped from a sycamore and helped out by a net work of barb-wire. Such homes are fast disappearing as the settlers prosper.

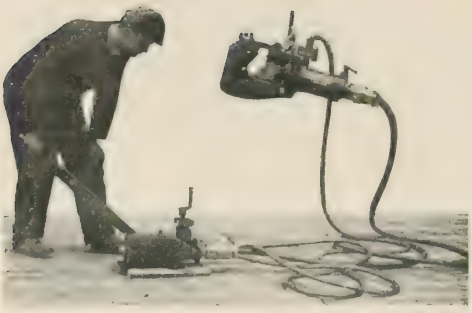
FLOUR FROM SUGAR BEETS

A NEW and important use for the sugar beet seems likely to be found in the manufacture of flour from it. In fact, this kind of flour is already being turned out in considerable quantities at Suresnes, in France, where an enterprising person named Alphonse Huillard, has built a huge "dryer" for the purpose.

The first part of the process consists in chopping up the beets and drying the water out of them. They contain, to start with, about 72 per cent of water, nearly all of which is removed by evaporation. By this means 100 pounds of dry material are obtained from 357 pounds of beets.

A RANCHER'S HOME AT COPPER CREEK ARIZ.

SUGAR BEETS IN ABUNDANCE.



Submarine Wire Rope and Chain Cutting Machine

The dry material contains over 70 per cent of sugar. That is to say, there will be more than seventy pounds of sugar in every 100 pounds of the evaporated product. Accordingly, the latter, on being ground to a fine meal, is exceedingly sweet, and well adapted for the making of cakes and puddings. It is estimated to contain something like eighty-two per cent of pure nutriment.

The expectation is that this new kind of flour will come into extensive use, especially in the manufacture of cakes and sweet bread. It is not only very nutritious, but guaranteed germ-free to start with, by reason of the high temperature to which the raw material is exposed in the process of evaporation. With care, it can be kept germless.

First Authentic Photograph of a "Rat King."

SUBMARINE CHAIN CUTTER

THE submarine wire rope and chain machine shown in the accompanying illustration was designed in London, England, and is utilized for cutting wire rope or chain under water, the working lever being operated at any convenient position or distance from the actual cutter. It was especially designed for salvage work and in cases of ropes fouling ships' propellers and dock gates. It is also utilized to advantage for naval purposes as in clearing away obstructions used in harbor defense, buoy line and mine cables. It is stated that with this unique apparatus wire ropes up to six inches circumference of any make or quality can be cut in about a minute.

In charging the cutter the ram is moved back and the reservoir filled with clean water with a small quantity of glycerine added, the air screw in the device being opened and the relief valve screwed up when ready to cut the rope. The cover is opened and the rope inserted when the former is replaced and locked. The pump is then operated by means of the lever until the rope is cut by the shears. The relief valve then has its screw slackened in order to return the shears.

LIVING CARD TRAY

THOUSANDS of visiting cards have been attached to the little arbor on Inspiration Point, Southern California, until it has nearly enough old pasteboard to supply a paper mill. Not only the side of the "proposal bower," shown in the photograph is adorned with these bits of cardboard, but every branch and twig forming the little arbor is similarly bedecked. Names and addresses from all parts of the world may be read on these cards, as it is one of the great points of interest for tourists.

This living card tray is only another means by which people, tourists especially, show their craving for leaving their names and addresses in prominent places. This propensity usually grows stronger the farther from home the traveler finds himself.

The "Proposal Bower."
Cards are hung here by tourists from all parts of the world.

FREIGHT CAR TAKES TO STREET

A PECULIAR wreck in which no one was hurt is this conglomerate mass of coal cars, house, and locomotive. It happened at Madisonville, O., near Cincinnati.

A through Baltimore & Ohio fast freight ran upon an open switch leading to a siding where the coal cars and locomotive were waiting for it to pass. The impact was so great that the cars and engine on the siding were pushed from the tracks through a side yard between the two buildings in the picture and over a stone wall upon the main street of the little town. Although more than a dozen persons were in the store which was wrecked and almost as many passing on the street and several people were sitting on the veranda of the house next to the wreckage, not one person was injured. The crews of both engines escaped by jumping.

NOSE-RING ORNAMENT FOR YOUNG BEAUTY.

BEAUTY AND THE NOSE-RING

THERE is no accounting for tastes in the matter of beauty. We Occidentals, for example, have never been able to "stand for" the nose ring. Yet, if there is a style of ornament popularly approved in many parts of the Orient, and particularly in India, it is just this.

If it be desirable to pierce the ears, and hang jewels from those appendages, so convenient for the purpose, why not employ the nasal organ in like manner? A suitable hole is easly made through the lower part of the fleshy partition between the nostrils, and lo! a most obvious opportunity for decorative effect in dangling bijouterie. Nearly every woman in India, who pretends to any sort of style, wears a nose ring. It helps to disguise the ugliness of a homely face, and lends piquancy to a pretty one.

CURIOUS FREIGHT WRECK.
Spill of cars which wrecked a store in Ohio town.

CONTRAST IN TREATIES.
Whale's tooth, emblem of a savage agreement, and official United States sealed paper.

WHALE'S TOOTH FOR A TREATY

ONE of the most interesting of the curiosities preserved at the Department of State at Washington, is the tooth of a sperm whale, which was formerly the most prized of the treasures of the Kings of Fiji. The tooth was handed down through many generations of royalty, and was understood to have been originally bestowed by the principal god of Fiji. The prosperity of the realm, in fact, was supposed to depend upon its careful preservation.

Unfortunately, the last King of Fiji borrowed from certain Englishmen a lot of money which he was unable to pay. The British government threatened to grab his islands in satisfaction of the debt. He appealed to the United States for help, and offered to us the whale's tooth, as a sort of treaty. But we never did anything to help him.

SHOE ROCK AT LA JOLLA, CALIFORNIA.
Odd formation on the beach that deserves its name.

SHOE ROCK AT LA JOLLA

THE famous caves of La Jolla, a few miles from San Diego, are an objective point for many thousands of tourists annually, but few of these pay much attention to the curious rock formations on the bluffs above the caves. Among these are "Elephant Rock," the "Alligator's Head," "Seal Rock," and others, named from more or less fanciful resemblances to animals and other objects. Perhaps the rock that most nearly answers to its name is "Shoe Rock," not of very large size, but resembling a shoe so closely that the most sluggish imagination cannot fail to perceive the likeness.

SPEEDY HYDROPLANE

ALTHOUGH much has been heard of the exceptionally high-speeds attained by the modern hydroplane type of boat, until now no practical seaworthy craft has been produced utilizing this principle. The development of the motor engine has made it possible during the last year or two to make hydroplane boats rise out of the water and skim along on the surface. The difficult problem, however, has been to produce a form which is sufficiently like an ordinary boat to run without undue resistance at moderate speeds, and when going at high speed in rough water to be equally seaworthy as an ordinary boat. This result has, however, been achieved in a most satisfactory way in Sir John Thornycroft's design. As soon as the boat gets up to a high speed it is seen that there is a curious section given to the bottom of the fore body, which section dies away amidships where there is a sudden change of form, the lines of the after part of the boat being quite hollow and terminating in a flat form of stern which is slightly wider than the section a little before it. The effect of

HYDROPLANE THAT HAS MADE HIGH SPEED.
Sir John Thornycroft's recent design of a water-skimming craft.

this form is that the boat very readily rises up right on to the surface of the water, only touching it on a small area amidships and again just at the stern, so that skin friction and wave-making are almost entirely eliminated, while at the same time there are no flat places in the bottom of the vessel which would be liable to be damaged in rough water when the boat was going at high speed from wave to wave.

A TURTLE'S NEST

ALONG the southern coast and among the keys of Florida one may occasionally detect little mounds of sand on the beach, almost a sure indication of the nest of the green turtle. This creature first digs a pit in the soft sands by means of its flippers from fifteen to twenty inches deep and a few feet above high-water mark. In this hole the mother turtle buries herself for two days. When she emerges she has invariably left behind a nest of eggs, which vary in number from eighty to as many as two hundred. She then fills in the hole and leaves the hatching to the heat of the sun. An interesting fact about these eggs is that the shells are quite soft. The period of incubation is about sixty days.

A TURTLE'S NEST.
How the green turtle hides its eggs.

As soon as they break out of their prison the young turtles immediately make for the water. Unfortunately they have many enemies—rats, birds and crabs steal the eggs while as soon as the baby turtles reach the water they are liable to be devoured by the larger fish. Indeed, if all the eggs laid by these creatures were hatched and the turtles attained to an average size, these creatures would be almost as plentiful as cod.

THE HENLEY REGATTA.
Remarkable spectacle at the presentation of cups to winners at the recent Henley regatta on the Thames in England. In the range of the photo there are at least 2,000 people in all sorts of boats, while far up and down the banks out of range of the camera were as many more, with the shores also closely packed with spectators.

Concrete Zoo Building.
One of Cincinnati's new structures for animal homes.

CONCRETE IN THE ZOO

A REMARKABLE handling of reinforced concrete has been applied to arching and dome work construction in the building recently completed for the Cincinnati Zoological Garden.

The principal feature of the building is the concrete central dome. A network of steel wire meshes was first made over a ribbed form of steel rods embedded in the walls of the building. The underside of the steel network was then given a two inch coating of hard plaster. After this was thoroughly hardened four inches of concrete consisting of 1 part Portland cement, 2 parts of sand and 4 parts of crushed gravel was spread on the outside and finally as a waterproof coating a 1-inch coat of cement soap and alum was given. This was thought to surely make the dome waterproof, but when the wet winter season began the dome leaked badly and it was found necessary to chisel off the 1-inch coating and waterproofing mixture mixed with 1 to 3 of cement and sand was applied 1 inch thick. This last mixture proved entirely satisfactory.

Interior of Concrete Zoo.
This handsome permanent building is a new departure for its purpose.

Wrecked Vessel Repaired With Concrete.
Unusual method of temporary defense against sinking.

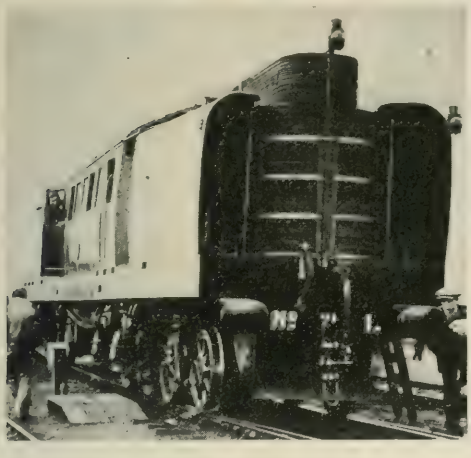
STEAMER REPAIRED WITH CONCRETE

MANY and varied are the uses to which cement and concrete are put in this age when building materials of all kinds command record prices. There are times when it is employed where conditions are such that the use of wood or steel would be impracticable.

Such a case as this was afforded when the steel freight steamer *Collingwood* collided with the steamer *George L. Craig* in the river at Detroit, Mich., and was sent to the bottom with a gaping hole in its hull. The aperture was sufficiently large to permit a big truck to be driven through it, and so near the keel that raising the vessel promised to be a very difficult task.

Departing from the usual method of procedure, the wreckers put canvas aprons on either side of the gash, the outer one forming a chute at the upper end that extended above the surface of the water. Into this a mixture of ce-

ment and crushed stone was forced, the material settling to the bottom of the apron until sufficient to close the aperture was deposited. When the concrete was sufficiently hardened the pumps were started, a cofferdam having been previously constructed about the submerged vessel, and it was readily floated and towed to a drydock, where the concrete apron was removed and repairs made.



SCOTCH TURBINE LOCOMOTIVE.
New design recently tried at Glasgow.

The illustration shows the hull of the Collingwood with a portion of the concrete apron removed.

DAINTY AUTOCAB

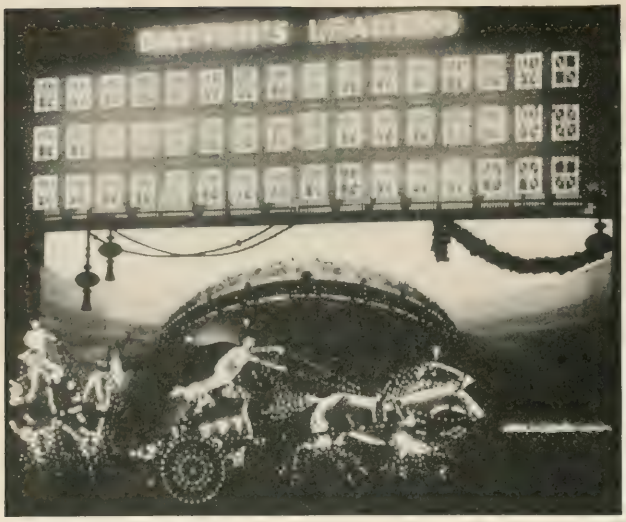
THIS little cab was built for the lady who owns it, and was fitted to her as a tailor would fit a gown, being only 26 inches wide and 56 inches high inside. It carries her about at any speed up to 25 miles per hour, yet gives her a freedom of individual movement like being afoot. It took eight months to design and build, and cost nearly $7,000. The passenger's seat is very low. The door swings open in either direction, or may be removed entirely. The inside is richly upholstered. There is a hot water heater under the floor, electric lights inside and out, handy cases for writing materials, toilet articles, etc., silver trimming throughout. The car can "turn on its heel" in a four-foot circle.

DEVELOPS 1,000 HORSE POWER.
The turbine has made a new success in the railroad field in Scotland.

FIRST SCOTCH TURBINE LOCOMOTIVE

THERE has just been completed at Glasgow, Scotland, the first steam turbine-electric locomotive. The electricity which actuates the motors is generated by a dynamo driven by a turbine engine. Superheated steam is furnished by a boiler situated in the rear. The turbine makes 3,000 revolutions per minute and develops 1,000 horse-power. The essence of this innovation is the securing of increased efficiency and consequent economy and otherwise by adding a condenser and substituting the continuous rotary motion of the turbine and dynamo for the reciprocating action of the present wasteful engine.

MUCH LUXURY IN SMALL SPACE.
Auto built to order that has unusual features.



HUGE ELECTRIC SIGN.
Great private light display at Dayton, Ohio.

MONSTER ELECTRIC SIGN

SCARCELY another city of its size in the world has a more attractive main thoroughfare at night than the city of Dayton, Ohio. An especial impetus has been given to decorative lighting and the production of elaborate signs by the location of that city of several firms who manufacture unique electrical display. By far the most beautiful and intricate of these is a reproduction of a Roman chariot race and more than a year's time has been required to build the display.

The illumination complete with its supports is about fifty feet long and stands nearly forty-five feet above the roof of the building upon which it has been placed. While the photograph shown here gives only a very meager idea of the beauty and ingenuity of the display, it serves to give a general impression of its form. The sign is about three times life size. The wheels of the leading chariot stand about the height of a man and appear to be turning rapidly when the sign is in operation.

Every detail that can possibly be worked out in fire has been reproduced. The breeze carries the cloaks of the charioteers waving behind them as they apparently dash on toward the goal, while the horses' legs move in rhythmic beat, producing an effect which would seem almost impossible by artificial means. Even the dust in the wake of the wheels of the chariot is shown, while the whole is studded with nearly ten thousand incandescent lamps of various colors. Ahead of the leading chariot and in the distance appear five armored cavalrymen, who in the picture are apparently clearing the way for the great race, and following the leading chariot are two others rushing on with a vain endeavor to overtake the one in the lead. The arena is decorated in the most beautiful color effects, with festoons of light outlining the galleries upon which appear crowds of people who have come to witness the race.

The entire display is most beautifully painted in colors and in addition to the lamps which outline the figures the picture is illuminated from above by a row of lights under a powerful reflector. Many of the devices used to produce the

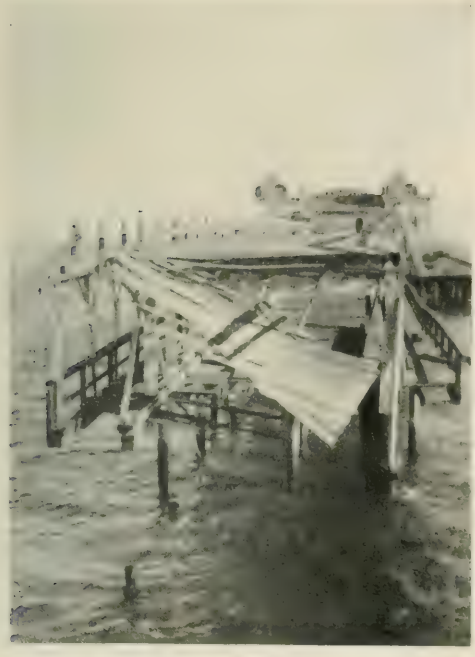
BIG CALIFORNIA PIER THAT WAS WRECKED.
Structure that cost a hundred thousand and became a prey to the waves.

electrical effects are inventions of the builders and so intricate is the wiring that more than two months was required to make the electrical connections alone, and about two hundred thousand feet of wire was used for the purpose.

Above the picture itself is an arrangement of lights by which the names of various business houses of the city may be displayed. The sign is one of a number to be placed in various cities for the purpose of advertising the leading merchants, but the one described is by far the most elaborate and is recognized as one of the most costly electrical displays of the character in the world.

The use of electric lighting for private advertising purposes is becoming so general that little surprise is shown by the public at any ordinary exhibit. But such pieces as this are not yet common. Manufacturers of these signs claim, however, that their industry is yet in its infancy and that greater wonders are to come. It is easily believable in view of the swift development so far.

FALLING OF GREAT PIER.
How the high rollers wrecked the long beach dock.



CLOSE VIEW OF THE WRECK.
Havoc wrought by the Pacific's unruly billows.

WRECK OF ONE HUNDRED THOUSAND DOLLAR PIER

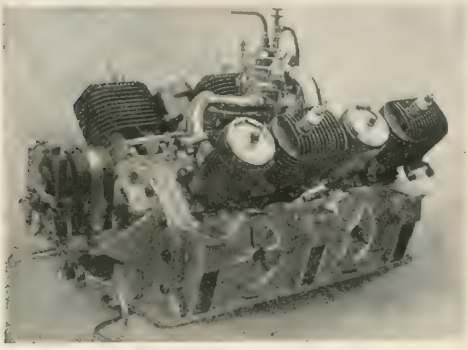
THE huge double-decked pier at Long Beach, California, was wrecked early in July by heavy seas which literally beat it to pieces. The strange feature of this wreck is that though the rollers were of unprecedented height there were no high wind or earthquakes reported to account for them. The three photographs give a complete story of the disaster as one of them was taken as the structure fell, the second immediately afterwards and the third is a close view of the break showing the resistless impact of the waves. This pier was constructed a few years ago of pine piling and in addition to this caissons filled with concrete were used, but the latter were far from satisfactory. The action of the salt water is supposed to have injured the cement for it is reported that some of the concrete piers were crumbling away in the middle before the crash came.

Fortunately no lives were lost, as pleasure seekers had been warned off the pier at the approach of the high rollers.

TWO NEW AIRSHIP ENGINES

A WELL known English experimenter with internal combustion engines has evolved two new gasoline motors which possess many interesting features. One is a multiple compound two-cycle engine, and the other a positive explosion turbine.

The system adopted in the multiple compound two cycle motor is different from that generally employed. The firing unit comprises what is termed a "charging and firing couple." The number of such units may be varied as desired according to the power required.

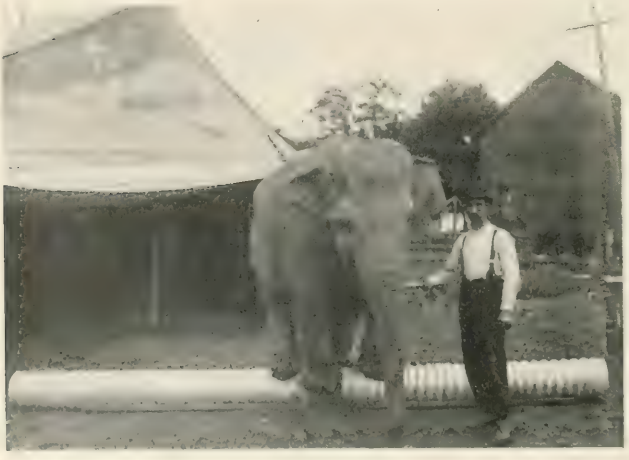


NEW AIRSHIP ENGINE.
One of the recent additions to the aeronaut's aids.

There are two cylinders set side by side with connection at the combustion chamber. Each has a separate piston but work together. Beside them is a smaller cylinder also having a piston. The latter is used for taking in the charge from the vaporizer, and at the precise moment forcing it into the first of the firing cylinders through sliding valves.

CURIOUS FORM OF ENGINE.
Another design that will help us to fly.

The explosion turbine works on a similar principle, but instead of the whole engine rotating about the shaft as with the existing type of rotary engines, the case is fixed and stationary, and the shaft set in revolution as in the steam turbine. In this engine the action is spiral, an ingenious arrangement having been adopted to transform a truly circular path placed at an angle into a right or left hand double helical worm drive. The angular path is the feature of this engine. It gives a very high mechanical efficiency, while the method of construction enables a smaller and more compact engine to be obtained.

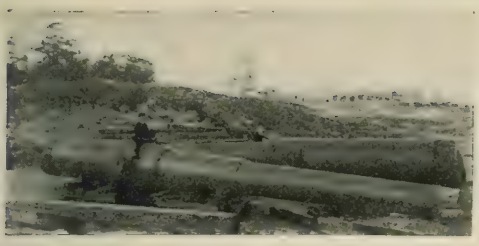


WORK ELEPHANT PERFORMS TRICKS.
Balancing feat executed by big beast, without previous training.

TEST OF AGILITY

THE accompanying photograph shows an elephant weighing 4,950 pounds balancing on a 12-inch corrugated metal pipe sixteen gauge in weight. Because the elephant had never seen a pipe of this kind it took a great deal of persuasion to induce him to stand on it, the trainer explaining that an elephant is always afraid to mount a strange article for fear it will crush under its immense weight.

The photograph was used by a manufacturing



BIG GUNS FOR WESTERN FORT.
Part of armament for Puget Sound fortification.

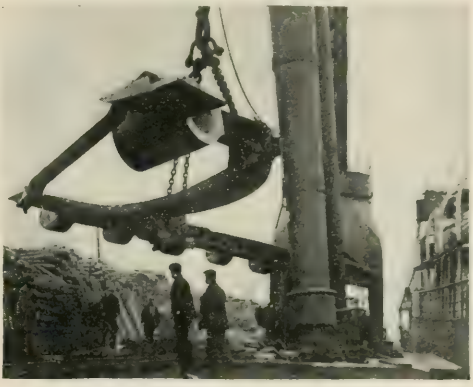
concern to illustrate the great strength of sheet metal when corrugated and formed into tubes.

MONSTER TWIN LINERS

THE two new White Star liners *Titanic* and *Olympic* are rapidly nearing completion. These twin ships will be the largest vessels afloat. They will each be nearly 900 feet in length and displace nearly 60,000 tons of water.

At the present time the "Olympic" is fully plated, and the "Titanic" in frame. The huge gantries under which these two vessels are being built have for the past year been recognized as a landmark in Belfast Harbor, but the vessels themselves now take the eye of every observer, and the launching of the *Olympic*, which is now being looked forward to with so much interest, will be in many ways the most important and eventful feat so far in the history of English shipbuilding.

One illustration shows a huge casting weighing fifty tons being shipped on board a freighter at an English port. It is the upper part of stern frame for the *Titanic*. It necessitated a special train and Sunday transit as it occupied two tracks.

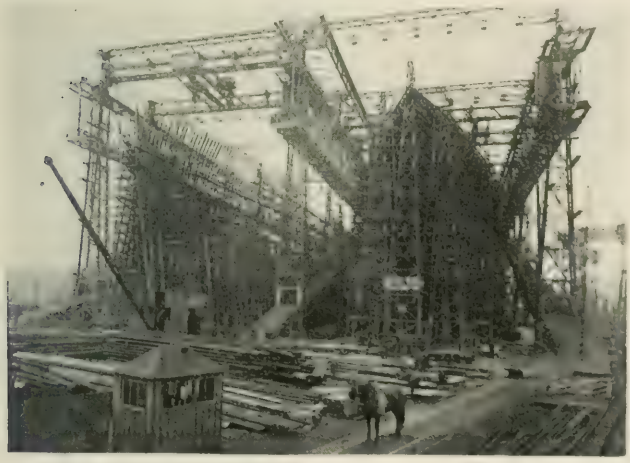


SCENE IN THE SHIP-YARD.
Huge castings for one of the ocean leviathans.

UNCLE SAM'S LATEST FORT

THE newly erected fortifications at the entrance to Puget Sound are being constantly strengthened and improved. At present the long sandy spit known as Point Wilson, lying beneath the guns of Fort Worden, is being fortified by the installation of two monster 12 inch guns.

The two guns, which weigh 52 tons each, are at present lying on the sand, awaiting the completion of the emplacements now in course of erection. Over $250,000 has already been expended upon the concrete emplacements and considerable more money will be needed before they are completed. Thus it will cost in the neighborhood of $300,000 to provide for the mounting of two guns, rather an expensive proposition, most persons would say.



GREAT LINERS NEARING COMPLETION.
New view of the big White Star boats in building.

SILVER SHIP FOR PEARY.
Gift of Royal Scottish Geographical Society to American explorer.

PEARY'S SILVER SHIP

THE accompanying illustration shows a model ship which was presented to Commander Peary by the Royal Scottish Geographical Society. The ship is of silver, weighing over one hundred ounces and standing about two feet in height. It represents a three-masted vessel of the late sixteenth century type in full sail. On one of the sails is engraved the badge of the Royal Scottish Geographical Society, while another bears an inscription in Latin, the translation of which into English reads as follows:

"This representation of a ship such as was used by John Davis, Henry Hudson, William Baffin, illustrious Arctic navigators of the olden time, has been presented by the Royal Scottish Geographical Society in token of congratulation, admiration, and recognition of Robert Edwin Peary, American citizen, an explorer of the frozen Arctic not less daring than his daring predecessors, who was the first to attain to that noble goal so long sought by innumerable bold mariners—the North Pole." Edinburgh, May 24th, 1910.

LEAP FOR LIFE

THIS thrilling feat of leaping from an airship in full flight was recently performed by a western camera artist—on a photographic plate. In the photograph the performer is seen guiding the machine in mid-air at the same time that he is making the hair-raising jump, so that no damages resulted except to the camera's reputation for veracity. That received a sudden and fatal jolt. This picture is one of the clever "fakeographs" made by this artist of mystification and his partner by means of a stationary "airship" and a combination of negatives to form a print.

BIGGEST OF RECENT GIANTS

ONE day, not long ago, a giant arrived at the port of New York. He was probably the tallest man that has been seen in this country since the days when the famous Chang toured the

A MERRY LEAP FOR LIFE.
"Fakeograph" that gives a startling effect of reality.

United States with Barnum's Circus. It will be noticed that the shoulders of the ordinary men in the picture do not come as high as his watch chain.

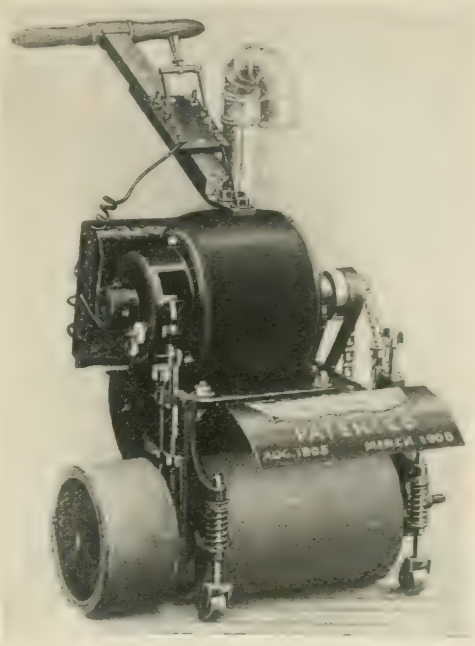
The two common sized men are immigration officials. One observes that the giant's hands are enormous—this being in fact a feature of most giants. Another peculiarity is that they invariably wear tall silk hats; and, unfortunately, they hardly ever live to reach the age of forty-five years.

PRESENT DAY GIANT.
Recent visitor in New York who boasts extraordinary growth.

ELECTRIC FLOOR SANDER

SANDPAPER is said to be the best material to use in surfacing a wood floor and a novel electrically operated machine has been devised for the purpose which is rapid in operation, economical and easily controlled, the cost of power and sandpaper being only about $2 per day for a surface of about 2,000 square feet polished in eight hours.

The main roller of the surfacer shown in the accompanying illustration is about twelve inches long and is provided with a dust collector or blower making it possible to surface floors in the finest residences and offices without inconvenience or annoyance.



ELECTRIC FLOOR SANDER.
Useful machine that surfaces floors.

The roller is covered with pure rubber which forms a cushion on which is clamped the surfacing or polishing material, such as sandpaper or cloth, the speed of the sandpaper roller being nine hundred revolutions per minute.

When starting the motor the roller cannot grind into one spot on the floor as the machine is so constructed that the operator can leave the machine without stopping the motor, as the roller is automatically raised from the floor the moment the handle is released. The machine is very easy to operate, by raising the handle the revolving surfacing roller is instantly brought in contact with the floor, which gives the machine a natural tendency to go forward of its own accord. It is stated that no matter what the condition of the floors may be this electric machine will surface them perfectly smooth and will absolutely remove all the "muck" or oil or wax which accumulates in rinks and dance halls.

WINTER LANDSCAPE AT 110 DEGREES

A TREE covered with white crystals until every twig of it is apparently formed of delicate lace-like frost—that is the appearance of the tree in this remarkable photograph which was taken on an August day when the thermometer registered 110 degrees.

The tree stands within one hundred feet of the engine house of a mine in Arizona and every day the sludge from the boilers is blown out with great force, the white particles clinging to everything they touch. The tree was killed long ago by this treatment and now stands in the middle of a winter landscape, several hundred feet in area, for it will be noted that all the boulders and ground about it are covered with white "snow" while the hillside in the background is unaffected.

WINTER SCENE IN AUGUST.
Frost effect produced by boiler sludge blown out upon landscape.

BEADS OF ROSE PETALS

IN making black beads out of the petals of roses, it is believed that the women of California have revived a lost art, practiced by a sisterhood of Europe in the Middle Ages, but forgotten for centuries. It is claimed that the nuns of a certain convent used to take the pulp left after the extraction of attar of roses, and make it into black beads for rosaries, the product resembling dull jet in appearance. As there is no attar of roses manufactured in California, the women of that State are under the necessity of going to some trouble to provide the material. A large quantity of rose petals are gathered (a matter of small difficulty in that land of roses) and are run repeatedly through an ordinary food chopper, set to grind as fine as possible, until reduced to a smooth pulpy mass. This pulp is next spread thinly over sheet iron pans, and turned and stirred at intervals. The oxidation of the iron soon turns the pulp a dense black; the operation may be hastened by stirring into the pulp a small quantity of tincture of iron.

MAKING BEADS OF ROSE-PETALS.
New home industry taken up by California women.

As soon as the pulp has become dry enough to work easily and retain its form, small pellets are taken and rolled between the palms until perfectly round. These are then perforated with a hatpin or similar implement, and allowed to remain on it until perfectly dry. If desired, the beads before drying may be marked or ornamented in any way suggested by the ingenuity or skill of the worker. When so dry that there is no danger of further shrinkage, they are

STERN OF A MOTOR BOAT.
Latest devices for propulsion and steering of swift craft.

strung in chains and are ready for the adornment of the maker or purchaser. The fad in southern California has attained really amazing proportions, strings of the rose beads selling at anywhere from $2.50 to $10, depending upon their length and their elaboration.

Much of the attractiveness of the rose beads is due to the faint suggestion of the perfume of roses that remains with them. Unfortunately many of the California roses are ordorless. To remedy the deficiency, it is customary to mix a drop or two of attar of roses with the pulp before molding it into beads.

There is no good reason why this attractive and pleasing fad should remain a monopoly of the women of California. The manufacture of the rose beads is neither complicated nor difficult, and can be practiced wherever roses grow.

STERN OF A MOTOR BOAT

POWER and speed are typified in the accompanying photograph of the stern of the racing motor boat *Ursula*, which won the Cup of Nations one-hundred kilometer race in the Mediterranean off Monte Carlo last April at an average speed of 42.83 miles an hour. The stern of the hull is made broad and flat on the bottom to counteract the tendency of the bow to rise in the air when running at full speed and thus prevent "squatting" which is common to racing motor boats. The shaft of each of the twin propellers is connected to a twelve-cylinder, 400-horsepower gasoline engine built by the English firm of Wolseley. The exhaust ports for the two engines can be seen at the water line on the transom of the stern. It will be noticed that the propellers have great pitch and strength and are hung well below the hull so that they will disturb the surface of the water as little as possible. The shafts are journaled at the apex of broad, substantial brackets bolted to the hull and presenting very thin edges to the water in the longitudinal axis of the hull. The effort required to turn the rudder when the boat is running at full speed is very great, so that it was necessary to provide the substantial casting and steel cables shown at the top of the rudder. The *Ursula* belongs to the Duke of Westminster and carried the Union Jack in the races.

NEW INTERNATIONAL GATEWAY
The new international bridge across the [illegible] necting Brownsville, Texas, and Matamoros, Mexico, is now open for traffic between the two countries. This bridge was erected jointly by the St. Louis, Brownsville & Mexico Railroad and the National Railways of Mexico. It cost approximately $1,250,000.

TEN TONS OF TREE SEED

THE seeds of most forest trees seem absurdly small when compared with the seeds of fruit, vegetables and grasses, and it takes a great many to make ten tons, which is the quantity planted or sown by the Government in this year's campaign of restocking the National Forests. Jack pine, the most important tree for planting in the Nebraska sand hills, average 125,000 seeds to the pound, and it takes 10,000 seeds of the western yellow pine, the tree most extensively planted throughout the National Forests, to make a pound. Altogether, the ten tons of seed represent about three hundred million single seeds.

There are now twenty-four National Forest nurseries with an annual productive capacity of over eight million seedlings, but there are millions of old burns on the National Forests which are waiting to be restocked. In some localities the Government has had to purchase tree seed, but most of that used is gathered by Forest Service men. As a rule, the seed is collected in the fall months, when most conifers ripen their seed. Where lumbering is in progress the collectors follow the sawyers and take the cones directly from the felled trees, but in standing timber the task is much more arduous. The men must often climb tall pines and pull the cones from the branches as best they can. The cones are dropped to the ground and then gathered into buckets, transferred to sacks, and transported to a central point for further treatment.

HOT SPRINGS IN ICELAND.
Doing a washing in a city of the Arctic Regions.

The extraction of the seeds is tedious rather than difficult. In some cases the cones are spread out upon sheets in the sun, when, after a time, they open and the seeds drop out; in other cases it is necessary to resort to artificial heat. This is applied by placing the cones upon trays with screen bottoms and raising the temperature of the entire room to the proper degree. The cones open, the winged seeds fall out, and the seed is separated finally from wings and dirt by a fanning mill. A good many seeds have been removed from the cones by hand, but this is a sore trial to both fingers and patience.

RAISING TONS OF TREE SEED.
One of Uncle Sam's nurseries where millions of trees are beginning their growth.

HOT SPRINGS OF ICELAND

WE are usually accustomed to think of Iceland as covered by great snow drifts that are tossed and whirled by the biting winds. While Iceland is not exactly a tropical resort, yet there are through-

out this volcanic island many geysers and hot springs of boiling temperature. Many of these, as at Hveravellir and Geysir, are made beautiful by the great number of blue-green algae which are found in water of as high a temperature as 175 degrees Fahrenheit.

The women of the capital city, Reykjavik, save time and fuel by taking their washings down to the hot springs. Here the water is kept warm without any coal or wood being thrown beneath the boilers. With the aid of the hot springs, it is not much of a matter for these thrifty housewives to wash clothes clean.

COBBLESTONE ARCHITECTURE.
Unusual success with rude materials in house-building.

COBBLESTONE ARCHITECTURE

WHILE the use of cobblestones in connection with cement for house building has ceased to be a novelty, yet few have applied the idea with such eminent success as the San Diego, California, man, who built the two dwellings shown in the accompanying illustration. The houses overlook the bay, and harmonize perfectly with their surroundings. As a rule cobblestone houses are architectural monstrosities, but these dwellings are attractive in exterior appearance and comfortable in the interior, the combination of stone and cement making them cool in hot weather and warm in cool weather. They are good examples of their kind.

THAMES PUNTS

THIS peculiar type of boat is much in use as a pleasure craft on the Thames, England. It is called a punt, and is propelled by short paddles like our canoes. A long pole is also frequently used in the shallow reaches, but this requires considerable skill in handling to prevent the occupants of the boat from being ducked in the river. These boats much resemble the sampan so common on the rivers of China. The accompanying photo shows a lot of these boats hauled up awaiting customers for the Henley regatta, the famous annual English boat-festival.

TAFT CREATES NEW FOREST

A NEW National Forest has just been created in California, and christened "The Eldorado." The proclamation was signed by President Taft very recently.

This new Forest Reserve consists of 809,910 acres, which have been listed out of the southern portion of the Tahoe National Forest, and 31,701 acres additional taken from the public domain.

PUNTS ON THE THAMES.
One of the characteristic scenes at the famous English regatta.

Cougar Trap.
Crude but effective snare for savage beast.

COUGAR TRAP

COUGARS, the bane of the sheep raisers of the Olympic Mountain region lying west of Puget Sound, can as a rule be exterminated by the persistent use of the gun, poison bottle or trap. But recently a huge cougar appeared that resisted every effort put forth for his taking off, and continued to levy a heavy toll upon the various sheep pastures.

Finally a farmer erected the trap shown in the illustration. It was about ten feet wide by twenty feet deep. Across the rear end a partition was run, in which several life sheep were placed as a bait. A heavy sliding door was constructed which was operated by an ingenious trigger so nicely adjusted that a slight pressure exerted upon a cord stretched across the trap would bring the door down with a rush.

The trap proved a perfect success, as the cougar, in his efforts to get at the imprisoned sheep, entered the trap and made himself prisoner. The cougar, which proved to be the largest specimen ever captured in the vicinity, was sold by his captors for show purposes, and is now scarcely the worse off for his evil deeds.

Test for Quick Speech.
Wheel which registers promptitude of senses' action.

TEST FOR QUICK SPEECH

THIS little machine tells how quickly you can speak. It consists of a circular diaphragm, against which the person under test does the talking. Behind the diaphragm is an electric bell. When it rings, you speak a word as quick as you can, and the resulting vibrations causes the diaphragm to come into contact with a metal point, thus completing a circuit, and causing a steel pen to make marks on a slowly-revolving lampblacked cylinder.

The lampblacked cylinder is not shown in the picture. But it will be understood that, by the arrangement described, the machine registers the exact time required by the person to respond with the voice to the ring of the bell. It is what is called a "reaction-time" test, and may be used to determine the quickness with which any body is able to name colors, when the latter are thrown in succession upon the opposite wall.

Experiments performed with it are very interesting but indicate only the promptness of action of the senses.

Window Crack Turned to Account.
Jap's method of transforming disfigurement into an attraction.

Technical World Magazine

HENRY M. HYDE, Editor

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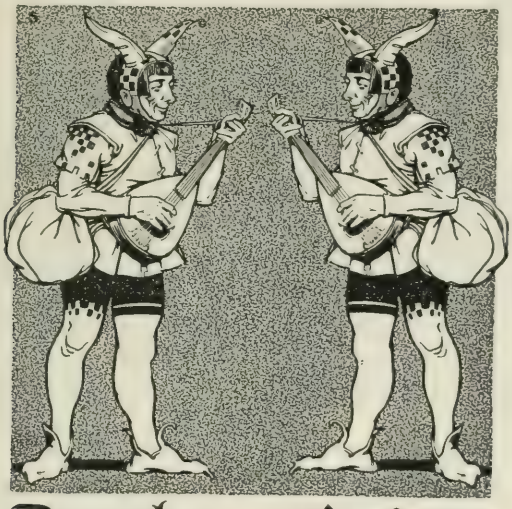

December ✠ 1910 ✠✠

THE SPLENDID SELF-CONFIDENCE DEGENERATED INTO A SWOLLEN AND DISEASED SELF-SATISFACTION AND CONCEIT.

—*The Great Gift of Work*, p. 106.

THE TECHNICAL WORLD MAGAZINE

VOL. XIV DECEMBER, 1910 NO. 4

WHY LATIN-AMERICA HATES US

By

R. W. EMERSON

Staff Correspondent in Nicaragua During the Recent Revolution

OUT of the picturesque tumult which has made the Mosquito coast and contiguous territory of the revoluting belt of Central America a focus for the variant efforts of soldiers of fortune and promoters of peace ever since Central American republics happened, there recently were cabled bulletins acclaiming that the Maxims spat no longer, that the Mausers all were stilled.

To altruists who by absent treatment had been striving to allay the strife that revolutionists and soldiers of fortune had been promoting by irritants of lead and steel, the cables sounded like chimes of peace on an Easter morning. To the American acquainted with the Latin mind and its ways, the message crackled with humor and bore a distinct odor of high explosives in storage. It told only of an interim between internecine strife in the field and the broaching of fresh caches of arms to prevent the overheating of the presidential chair by an ambitious occupant.

The foregoing may be deprecated by academic promoters of peace who wish well, but who suffer the difficulties common to wearers of rose-colored spectacles. To such, the writer commends a dispassionate review of the situation in Banana-Land with the conviction that the strongest ruby lenses will prove inadequate to establish a chronic optimism.

Those of our citizens who conceive that *dolce far niente* reigns unchallenged beyond the cocoanut palms which fringe the Atlantic lagoons and the Pacific seaboard of Latin-America are victims of delusion. It exists intermittently, but it doesn't reign. It simply manifests itself by fits and starts. The natives have too much fighting on hand to waste precious hours in hammocks. They enjoy better the war game of the Mauser and the Maxim with erstwhile tilting with machetes for good measure. A game always is more satisfying to the primitive in man when somebody is getting killed. In the bull-fight, there is only a chance that somebody will get killed. In the revolution, somebody is sure to get killed. Hence the supremacy of the revolution.

I sailed from New Orleans last December, a few days before the battle of El Recreo (now a red letter date in Central American annals) to keep a newspaper score card of the internecine tournament. It was a season of action.

Jose Santos Zelaya was scudding out of Managua with a bodyguard bristling with bayonets and carrying lives as

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cheaply as penny whistles. Rear Admiral Kimball's ammunition hoists swinging clear on the U. S. S. Albany, off Corinto, carried a menace which led many to expect him to pierce a Mexican gunboat with eight inch holes. The Isthmus of Panama swarmed with hurriedly mobilized American marines, and Secretary of State Knox was expected to precipitate armed intervention in Nicaragua. Schooners full of soldiers of fortune, who in turn were full of rum, were recruiting the ranks of the revolutionists camped under the banana fronds along the Escondido river at Bluefields.

Señor Quintana—A Nicaraguan Censor and Director of Telegraph.

Turbulent swashbucklers inspired by a thirst for gore and adventure were paying dearly for their whims under the stilettos of energetic mosquitoes which injected fever where they bit. Unaccustomed stomachs were wrestling with green bananas. It was a day when the unrest of the Latin had reached such a pitch as to require choice space in American newspapers while harried statesmen were put in need of hair restorers.

Central American affairs were preeminent in international discussions. Monotonously there was raised the question:

"What is Knox going to do?"

My mission included a thorough search for the motives which actuated Latin-Americans in their thinly veneered dislike of Americans. I was eager to begin the search at once. On the steamer I met my first opportunity.

Swinging out of the delta on board the fruit steamer Abangarez bound for Colon, I met the Latin—three of him. The contrast offered, in this trio, was exceptional.

One was a snappy youngster, clean as a die, with an address which would have been a credit to an honor graduate of a leading American university. Another was a Cuban patriot who had suffered in Spanish dungeons under the shadow of the garrote and in the penal settlements of Spanish Africa during the Cuban struggle for independence. The third man was a Panamaian diplomat, slender in build, white haired, gray moustached and dignified in bearing. In its conspicuous characteristics, it was an incongruous triumvirate, but its opinions respecting Americans and their attitude towards Latin-America were remarkably well mortised together.

The smart young man was qualified to be the mouthpiece of opinion for his company. He spoke English faultlessly, but contended that his French was better than his English, and that Spanish, his mother-tongue, accommodated itself to speech more easily than did either of the others. His attire was the last word in sartorial correctness, and his finger nails were the ultimate in pinkiness and polish.

He had lived in America from coast to coast and from the Canadian border to the Gulf of Mexico. He knew the United States more intimately than some of its citizens who belong to societies of heritage, yet he bore only resentment against the government of which the visible heads were President Taft and Secretary Knox.

This antipathy was what I had come to seek. I probed into it while I stood with my new found acquaintance in-

WIDOWS AND ORPHANS AWAITING AUDIENCE WITH THE PRESIDENT OF NICARAGUA.

haling the stale odor of last week's cargo of bananas percolating from the cover of the fore hatch.

I found my dandy Latin man-of-the-world to be a Chilean by birth. He had been educated in England and the United States and trained in the silk business by a French firm in China. He was on a trip all around South America, drumming up trade for his Gallic employers.

"FOR THE FRONT"—A CHRONIC CONDITION OF CENTRAL AMERICA.

AMERICAN SOLDIERS OF FORTUNE IN CENTRAL AMERICA EAT QUEER FARE.
The lizard in the illustration is an iguana and is highly esteemed for food by the natives.

And in his breast, as within a boiler, hummed indignation against everything official bearing the tints of the stars and stripes.

Senor Gomez, the Cuban patriot, was similarly animated with profound disapproval of Americans. He consumed red wine until it ran into his beard while sitting apart from the despised northerners whose presence he apparently deemed a reflection upon the passenger list of the ship. As for the dignified diplomat, he was oleaginously polite and noncommittal, giving little hint that six weeks later I was destined to have my American mail and extra eyeglasses held up by him at Panama lest by possession of them I might incite incendiarism in torrid quarters.

Senor Morales, the silk-drummer, did most of the talking. My experience with him proved to be a logical forerunner of what I was destined to experience wherever I probed into Latin-American sentiment between Colombia and Mexico. Mexico, I expressly exclude from this discussion. The land of Diaz is another story.

Up in the ship's wireless room on that voyage, a nervous operator was eating his meals with one hand while with the other he relayed messages from Bluefields to Colon, and to the relay station on the Cuban coast, reciting the Estradan triumph at El Recreo which then was felt to presage the imminent fall of Managua. The silk man, the patriot, and the diplomat took such an energetic interest in the news as to forsake the red wine of the smoking room for the upper deck where bulletins fell faster. It was a revelation to hear them discuss the dictum of Secretary Knox to the Nicaraguan government respecting the execution of the two American soldiers of fortune, Cannon and Groce, who were buried with their boots on at El Castillo a few weeks previous to the flight of the Hon. Jose Santos from the presidency of Nicaragua.

The attitude of the three Latins and their fellow Latins on board was one of annoyed patronage towards the United States—the patience of a civilized race towards one that was vulgar and needs must be condoned for want of understanding of ethics. They affected to believe that the United States would not take up the matter of the murder of two of its citizens in a tropical jungle merely for the sake of justice. It was disgusting to them to theorize that the United States government had any business in taking exception to the treatment of its citizens by Central American despots, anyway. Every American criticism of the continued practice of slaughter in Central American republics by mercenary operators of rapid-fire guns was snatched upon greedily by the Latins as material for derision and complaint.

I was told that the United States had incurred the distrust and the displeasure of every Spanish American country south of Mexico. The men who told me so were engaged in frequent journeyings from the Rio Grande to Cape Horn and were in a position to know. In support of their statements, they displayed edi-

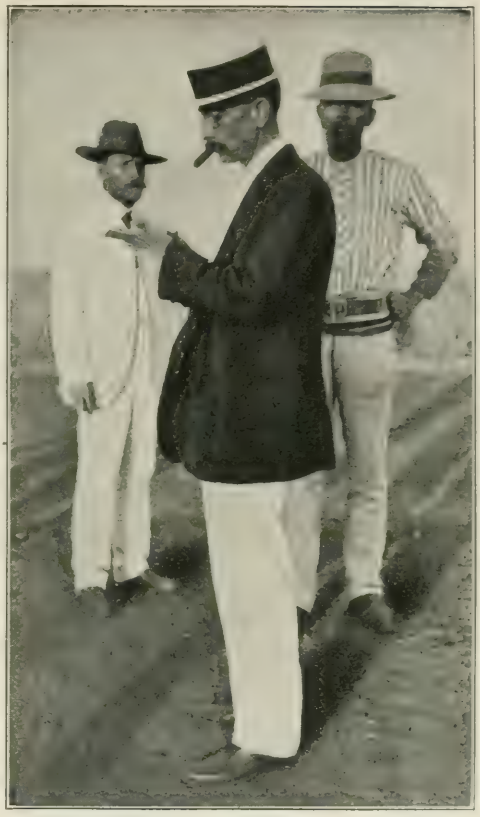
torials in newspapers of the tropics, unanimously promulgating the theory that the North American dream is the formation of an empire into which the Latin-American countries are destined to fall as provinces, governed by viceroys sent from Washington.

The theory, while chimerical to American ears, I subsequently found to be the common interpretation of the Monroe doctrine by the man in the street in Latin-American cities. Profundity, worthy of a better cause, was devoted to embellishing the nightmare by making the Nicaraguan canal route a focus of worry in Washington lest France, Germany or Japan might essay to build a canal across the continent. This idea about the canal, I found so firmly and so generally rooted in Latin-America as to compel its inclusion well at the head of the list of popular Latin-American fallacies.

When a reckless cochero dumped me at the dust laden entrance to the Hotel Lupone in Managua, a fortnight later, I found a landlord bristling with resentment against the American sense of promptitude.

"You Americans expect us down here to do the way you do at home," he complained when I urged a porter to carry my traveling effects to a room and to look out for predatory scorpions. "You come down here and boss us around instead of following the customs of the country. Now the porter will put those things in the room by and by. This isn't Chicago."

The landlord was an Italian, but he had hit the nail on the head in voicing sentiments that would have come more adroitly from a native. That night and succeeding nights, I sat in the dingy lobby of the Lupone, watching statesmen, soldiers, planters and traders of the country voicing their inner thoughts with a freedom which increased in proportion with the imbibing of what seemed to me to be every known intoxicating drink under the sun. The majority of these men were possessed of more than a fair share of this world's goods, and their stations graded as high as the president's cabinet. In fact, the prime minister himself was not above a game of dice for the drinks in this good company.



DR. SEBASTIAN SALINAS—A HIGH TYPE OF THE LATIN-AMERICAN POLITICIAN, WHO WAS EDUCATED IN THE UNITED STATES.

After listening to the general conversation, there was no room for doubt as to the ethical inferiority ascribed to the United States and Americans. Assuredly were Americans crude people compared with Europeans. Who would salve his conscience to the degree of encouraging the sending of children to the schools of the United States to acquire American ways and manners of thought? Assuredly not a Latin-American imbued with patriotism and a proper respect for Latin traditions. Verily, the education of children among those blatant Americans must be discouraged while ships sailed the seas to England and France.

Some of the patriots who objected to American education were themselves examples of American education. Of such, it was easy to suspect political ambition

An Erstwhile Postmaster-General of Nicaragua—Alexandro Bermudez.

as a motive in discrediting their own alma maters. Nevertheless, the aversion to Americans extended from masters to menials with a perniciousness that was exasperating. Cab drivers covertly sneered at Americans and the American desire for haste while wilfully posing as obtuse in receiving directions in order to prolong the time of engagement. The waiters shook their heads over American requirements much in the way that one might shake his head over amusing vagaries of the mildly demented.

A Swiss drummer rendered conspicuous by a pair of tight French riding trousers which apparently were intended to be worn standing up furnished me a means of comparing the European with the American method of doing business. His line was French agricultural machinery, and inasmuch as he had been "making" the coast for several years, it was fair to assume that he was a success in his business.

For three weeks after his arrival at the Lupone, he did nothing save sit in the covered front yard of the hotel and idly speculate about the progress of the war while ragged urchins, after the manner of the country, polished and repolished his shoes. He assiduously cultivated and bought drinks for politicians and listened to their bombastic utterances without in the least committing himself in the matter of opinion. By the second Sunday night, he had progressed far enough in social intercourse with the existing political regime to secure a place at the president's table for dinner. The week after that, he went riding in a brougham with some of the women of the president's immediate household and dispensed Central American small talk between mouthfuls of the thick red dust which overlays Managua like a blanket. At the end of a month, he sailed away, a lamented social lion, carrying with him orders for machinery which could more acceptably have been filled by American manufacturers. He had caught favor in high places and his honors had been reflected upon the plantations.

An American drummer had burst into Managua about the same time as the Swiss, buoyant with affability which but thinly concealed his contempt for his prospective customers. He bought drinks for natives in the open, bragged about American machinery night and day and produced truthful figures to demonstrate its superiority.

When with European traders, he covertly congratulated them upon being "white," and in the confines of the International club, he drew long breaths of relief and told of difficulties in doing business with the "niggers." The Europeans treated him like a hail fellow well met, and then, straightway, with the intent of conserving their own interests against inroads from the United States, saw to it that the natives learned all about the American drummer's pleasure

THE SORT OF DWELLINGS NICARAGUAN VILLAGERS OCCUPY.

at meeting "white" people in Central America.

In consequence of this, the American found that he was welcome to buy refreshments galore for politicians and to talk about his machinery. He was conspicuous by his presence in public places, but nobody saw him entered as a guest at any family gatherings of note in official circles. He went away, openly cursing "niggers" and vowing that Latin-America wasn't a white man's country, anyway. If his experience in Nicaragua was any criterion the net result of his

A PLACE OF INTEREST TO COSTA RICA POLITICIANS
The custom house at Punta Arenas, on the Pacific Coast

trip there must have been a whopping big bill for expense without any orders to place against it. And if his firm was like some American firms, it probably put Latin-America on the black-list and left it to the European with the tight riding trousers to garner the spoils whilst pursuing social triumphs.

In the native newspapers, there was little of hypocrisy. Despite all the soothing literature dispensed by the astute Hon. John Barrett of the Bureau of American Republics, they reveled in outpourings of bombastic attacks upon the United States, expressed through the pens of volunteer editorial writers. In Central America, almost everybody who writes to the newspapers gets what he writes printed. This perhaps accounts for the boresome columns of inanity wedged between the patent medicine advertisements which are the mainstay of hot belt journalism. Jingoes vie with "Emulsion de Scott" and the brew of Lydia Pinkham, all in florid Spanish.

Senor Salazar—an American Citizen of Nicaraguan Birth, Who Has Striven to Introduce American Trade to His Native Land

Apparently every editorial writer in Spanish-America is obsessed by the belief that the Panama canal has been given up as a failure and that Uncle Sam has given up digging and gone home. The thoroughness with which this cheerful idea has left its mark in Nicaragua, for instance, was illustrated to me by the case of two intelligent young Americans who had been in the country two years, engaged in the mining business. They had accepted it as a fact from native reports that the Panama canal had caved in or been closed up by an earthquake. They were surprised to learn that the work was progressing faster than ever before.

"Now that the Panama canal has turned out to be a failure, the United States logically must turn its attention to the only other route—the route through Nicaragua"—was the assured way in which the Nicaraguan editorialists were wont to introduce their topic. Then they would proceed to state that the United States was seeking an excuse to seize Nicaragua to protect the canal route. Perhaps the editorial would wind up with the ostensible divulgence of a state secret to the effect that Japan and Germany had effected a secret treaty to build the canal across Nicaragua in defiance of the United States. Slurs against Americans on account of nationality and unpleasant personalities were frequent in the newspapers. Upon one occasion, an American woman was wantonly insulted in print.

Early in the present year, a formal protest against the attitude of the American press—presumably on account of the American newspaper habit of poking fun at the kaleidoscopic character of some Latin-American administrations—gained general circulation and approval in Spanish-American newspapers. The document was in Spanish and bore a New York date line.

Following is a free translation:

"The delegate general of the Spanish-American university has directed the following communication to the Secretary of State.

"The president, the delegates, the associates and members of the Spanish-American university feel keenly the occurrences which are taking place be-

THE SORT OF CHILDREN THEY RAISE ON CENTRAL AMERICAN PLANTATIONS.

tween the United States and Latin-America.

"The Spanish-American university works earnestly for the development of international peace, but in consideration of those of our members who are Latin-Americans, we desire to say:

"1.—That the insults of the press of the United States against the Latin-Americans have become intolerable.

"2.—That the opinion of the press is nearly the opinion of the society of a country.

"4.—That it is a very grave mistake to insult a great race and a great population on the theory that that race and that people are weaklings.

"5.—That all the Latin race of America is offended by the attitude of the American population of the north towards the Latin-Americans and—

"6.—That the threats of intervention in the domestic affairs of the Latin-Americans are much more offensive than these same troubles.

"Upon the foregoing premises, we demand to know the line of conduct observed by the department of state of the United States to ward off future insults; or if it will make solidly with the press of the United States in all sentiments."

Had a boycott been put in operation against American made goods, it could hardly have produced more complete European domination than was and now is apparent in the Spanish speaking countries. In Panama, on the verge of the canal zone, the amount of European merchandise on display was remarkable, although, of course, in the zone, the familiar American brands were in evidence.

In Managua, American goods, with the exception of patent medicines, were practically unobtainable. The beer came around the Horn from Hamburg. So did numerous other things. The stationery had a German watermark. Wines were Italian and French. Whiskies were Scotch in most of the cafes. Prints and other cloths were English. Canned meats were English or Australian. Canned fruits were from England and Scotland. The butter hailed from Denmark. The men who imported and sold these European products were Europeans themselves as a rule. And, as further evidence of our commercial

LATIN-AMERICA'S MEN AND WOMEN OF TO-MORROW.

isolation, the International club had few Americans in it.

Most of the coffee was marked for Hamburg and Havre. It was said generally that only poorer grades of coffee went to the United States for the reason that "Americans don't know good coffee."

Foreign merchants drank deeply of the wine and fomented the prejudice against Americans. Some were decidedly rabid in their dislike of "Yankees." They understood perfectly that it was to the profit of Europeans to get Americans disliked.

In Panama, at the Tivoli, a spacious tropical hotel of modern equipment and a God-send in the tropics, I found an

TOO YOUNG AS YET TO BE "REVOLUTIONISTS."

assortment of American promoters whose personalities seemed to explain some of the aversion that the Latin-American has under his skin for the American of the north. The promoters spent most of their days sitting in back tilted chairs upon the first floor piazza, conjuring up and discussing schemes for separating the little brown brother from concessions in sugar, bananas, rubber and divers other commodities which operate as a lure to commercial cupidity in the tropics. Viewing these agile minded individuals, I felt that the native had some reason to feel suspicious.

One promoter was just out of a Honduran jail; another was waiting for a friend to get out of a Panamaian jail, and several of the others had the manner of men who feared to venture into thoroughly civilized haunts lest they get into civilized jails. All of them had stock to sell in something, but generally, the active promotion was going forward through offices in the United States.

A number held grudges against the authorities at Washington because they had pricked their hot air balloons and stranded them in the palm belt with a thump. They were typical get-rich-quickers—as shifty in their consciences as they were impressive in what doubtless among themselves they would have styled their "fronts."

Recognizing the state of thought of the little brown brother, the majority of the promoters were seeking to curry favor with him by talking in favor of him and in disfavor of their home government—the United States. To the credit of the little brown brother, it may be said truthfully that he conducted himself with suavity but remained generally unimpressed.

The Panamaian newspapers were going it strong on the subject of Nicaragua. One of them, printed in both languages, displayed editorials referring repeatedly to "The Colossus of the North" and the "Giant of the North" as the United States is designated by jingoistic journalists near the equator. There was a lusty sentiment to the effect that the United States should leave the little brown brothers of the south free to shoot each other full of holes with rapid fire guns as frequently as they pleased, and refrain from annoying them by impertinent references to the execution of American soldiers of fortune while little brown brothers and presidents of little brown brothers were busy fighting. There was a general feeling among the natives to the effect that Americans more or less openly held the southern countries and the peoples of the southern countries in an amused contempt that was wholly unwarranted.

From Panama, my viewpoints successively shifted to Costa Rica, Salvador, Honduras and Guatemala. I met and talked with representatives of the most intelligent classes of all the countries mentioned, and without exception, I was able to detect the same feeling of deep seated distrust of Americans.

It became a matter of course to meet perspiring concession hunters who between drinks tearfully assured me in the hearing of natives that the people of the United States and the people of Latin-America were striving to put their lips to international lovingcups. Affable statesmen among the natives who were hoping to extract bribe money from American concession hunters for the voting of legislation favorable to concessions loudly voiced parallel sentiments. Both parties to the contest in compliments knew that they lied, and privately they admitted as much.

Despite the most earnest efforts for peace, the writer and foreign residents in Latin-America foresee only long continued hub-bub, political or worse than political, in sunny Banana-Land. The American must change his ways as Kipling's leopard changed his spots if he is to become a commercial messenger for the greatest good to himself and his employer in the lands which lie close upon the equator.

WHAT IT COSTS TO HOMESTEAD

By

CHARLTON LAWRENCE EDHOLM

"WHAT does it actually cost to homestead out here in the West?" That was the question I propounded to a prominent engineer engaged in reclaiming some of the vast areas of desert land in the Southwest.

The reply was characteristic. "That is a question I always side-step," he said with a smile, "and it has been put up to me about a thousand times. The fact is that it all depends upon the man. One homesteader can make a living and get rich starting on a given capital, while his nearest neighbor may make an absolute failure on twice that amount of money."

That is thoroughly Western, the habit of sizing up the man rather than "his pile" and estimating his chances of success by what he is rather than by what he has. It is logical that it should be so, for out here, far from the financial centers, it is the man who does the work rather than his dollar. And a man's work it is to settle in a new land, to bring water to the desert, to make his clearing in the brush or the forest, to build his house with his own hands and to take the long chances of tilling an unfamiliar soil.

But fortunately the call of the West lures with the greatest insistence those who are best fitted to cope with the conditions of the West. The long-limbed, lean-bodied wielders of the axe, tamers of bronco and steer, subduers of the wilderness, that is the sort our engineer had in mind when he spoke of the man who can make a living and get rich while his neighbor starves.

SOUTH DAKOTA LAND READY FOR HOMESTEADERS.

A RICH CROP OF THE SOUTHWEST.
Alfalfa field in New Mexico.

Unfortunately, echoing the virile call of the West is the seductive call of the Western land boomer, dulcet, siren strains of easy life and effortless rewards. Sometimes they are fairly plausible, sometimes they verge on the ridiculous. The Golden State, always a wonderland from the early days of gold seekers to the present day of the railroad folder, shimmers like a radiant vision before the eyes of many discontented ones back East. They are ready to believe the wildest statements. One family I heard of moved out from the Middle West implicitly believing someone's fairy tale: "It costs nothing to live in California, all you need is a tent, (merely for the sake of privacy, not shelter) fruit and vegetables are given away."

Truly, California is a land flowing with milk and honey, but the dairy man and the bee keeper present their bills with a regularity not at all Arcadian.

This clipping from a railroad booklet inviting homeseekers is just the kind of advertising that causes trouble. It is a standing invitation to the worthless, the slothful, the predestined failures to come and be a burden to the commonwealth that needs pushers, not leaners.

"It is easy to make a living in———. Too easy sometimes, for many grow careless and satisfied and beyond the slight effort required to provide for themselves and families dream away the quiet days. The men who work half as hard and half as long as they used to do in the East grow rich and independent."

This is one view of the Western rancher, smoking a cigarette in his hammock while kind Nature attends to the crops and the marketing thereof.

Here is another view: It was a drizzling winter night, raw and comfortless, just the sort of a night when a deep chair before the grate assumes a heavenly aspect to the belated commuter hurrying home from the office.

But at the edge of the sidewalk before the land office in Los Angeles several hundred weary and bedraggled men, together with a sprinkling of women and children, stood in line, or, to be more accurate, sat in line, some on soap boxes, some on the curb, and a few, who were thrifty and far-sighted, in rockers and steamer chairs upholstered with pillows.

One had even provided himself with an oil stove, at which he and his fellow keepers of the long vigil vainly endeavored to warm their shivering bodies.

They were victims of the land hunger, who had heard of a chance to acquire a little farm from the Government. Free land? Not a bit of it. Choice acreage in some mild and rain-blessed valley? Well, not exactly. The land to be thrown open to entry was on the Yuma Project of the Reclamation Service, and these people were willing to pay well for the privilege of settling near Yuma. You've heard all about Yuma, of course. It's that lovely little city in the arid zone from which they run those popular "keep cool" summer excursions to Hades—so the funny papers report—the excursionist, according to the same authority sending back post haste for his blankets.

A Western Irrigated Farm.
Alfalfa crop ready for stacking.

It seems incredible that people should stand in line for days and endure hardship to settle in the Southwestern desert. Yet there they stood in line. For the land hunger is upon us, and the good old times when Uncle Sam was rich enough to give us all a farm have come to seem an Aladdin-like tradition.

However, you can get an irrigated unit of forty or eighty acres for a moderate price, and if you have the courage to live on the desert until your water is delivered, and if you have the capital to support yourself and family until that same pleasant but indefinite promise is fulfilled,—why you have a good chance to make a living by hard work and economy.

A wise provision of the law is that the entryman must have actually seen the land upon which he wishes to file, thus weeding out prospective settlers who expect a quarter section of the Garden of Eden after reading some Western land boomer's prospectus.

Those who stood in line for many days and nights had seen the forbidding country on the banks of the Colorado, yet even with this preparation some of the lucky ones who drew winning numbers in the land lottery that followed quit in disgust after a few months test of the actual conditions. They had not known what they were "up against."

Now it is not with the intention of discouraging those who wish to take up land but rather with a view of preventing many disheartening failures that the editor of this magazine asked me to secure some authentic information on the actual cost of settling in the West. It was only after discarding tons of glittering generalities in the shape of "boost" literature that I was able to get down to the hard pan of solid facts.

Before going on to the facts and figures of what it costs to clear and prepare land and equip a farm, it is well to call attention to the general warning in President Taft's recent speech before the Conservation Congress in September.

"By the reclamation act a fund has been created of the public lands of the United States with which to construct works for storing great bodies of water at proper altitudes from which, by a suit-

able system of canals and ditches, the water is to be distributed over the arid and subarid lands of the government to be sold to settlers at a price sufficient to pay for the improvements. About thirty projects have been set on foot, distributed through the public land states in accord with the statute, by which the allotments from the reclamation fund are required to be as near as practicable in proportion to the proceeds from the sale of the public lands in the respective states. The total sum already accumulated in the reclamation fund is $60,273,258.22, and of that all but $6,491,955.34 has been expended. It became very clear to congress at this last session, from the statements made by experts that these thirty projects could not be promptly completed with the balance remaining on hand or with funds likely to accrue in the near future. It was found, moreover, that there are many settlers who have been led into taking up lands with the hope and understanding of having water furnished in a short time, who are left in a most distressing condition."

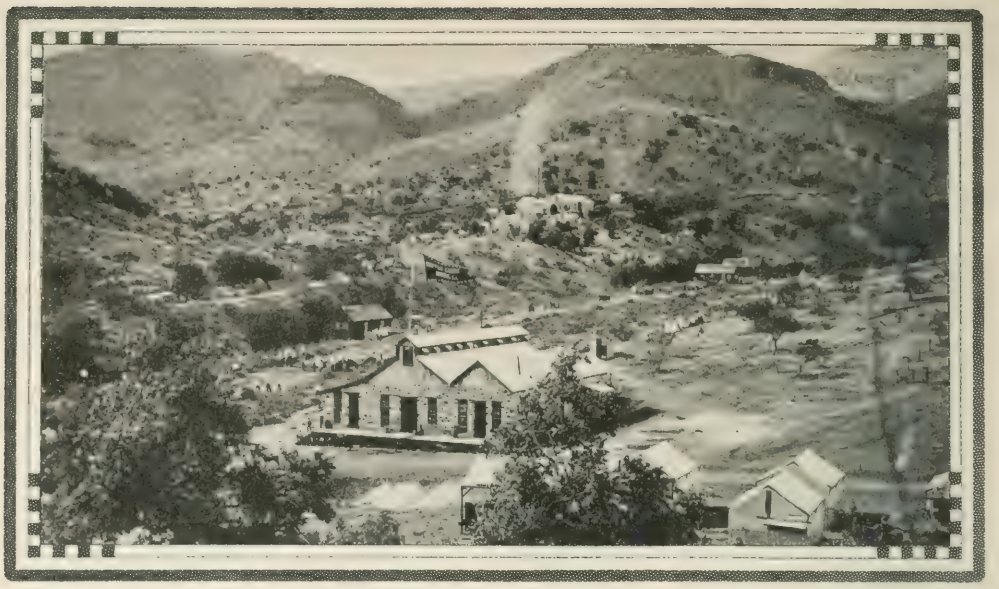
Mr. Taft has recommended a project for issuing bonds on the assured earnings of the projects, the cash to be applied on the completion of the works and the relief of the homesteaders, but this measure will not recompense the man who was forced out by a too limited capital.

It is obvious, therefore, that the first thing to consider in looking over the land in a reclamation project, private or otherwise, is the question: will my capital hold out until water is delivered and the first crop sold? Many a homesteader has had to answer the question in the negative after wasting his labor and money in preparing land for the water that never came—or that came too late.

In getting an estimate of the capital required, the gentlemen of the Reclamation Service have been of the greatest assistance to me, probably because they are thoroughly grounded in the habit of dealing with facts and figures and therefore can give a straightforward answer without a hint of side-stepping, equivocation or ambiguity, to a plain question.

The following is quoted from a letter by the Superintendent of Irrigation in the Shoshone Project-Settlement. It seems to cover the ground pretty thoroughly: "On an irrigation farm it is generally considered that about $2,000 is necessary to make a successful start, though naturally the amount of capital varies with the man; a great deal more depending upon the man than upon the capital. You appreciate, of course, that where one man will make good with

Upper Face of the Shoshone Dam.
One of the dams which make homesteading [illegible] in the arid West.



AN ARIZONA MINING CAMP.
A farm within reach of one of these mining centers is assured of a good income.

$1,000, another will fail with several times that amount.

"The actual cost of an irrigated homestead under the Shoshone Project is, water right, building charge, $46 per acre, payable in ten annual installments, without interest; maintenance and operation charge, which until further notice is $1 per acre per annum; land office fee covering his homestead entry, from $6.50 for a forty acre farm to $8 for an 80 acre farm; commissioner's fee $3.50.

"He must pay the first installment of his building charge and operation and maintenance charge at the time of the filing. This is $5.60 per acre. The total charge for a forty acre farm would be about $230, for an eighty acre farm about $460 at the time of filing. In addition to this amount one should have sufficient funds to put up his house, barn, fence and well; purchase stock and implements and buy provisions to keep himself and stock until his crop could be secured. His house may cost him from $300 up according to his needs and desire. Fence will cost about $100 per mile. Of course where he has an adjoining neighbor this expense will be pro-rated. He should also have a cow and some chickens.

"There are settlers on the Shoshone Project who came in last year in time to put in a crop which harvested for a forty acre farm upwards of $1,500 worth of produce. This is, I think, remarkable when it is considered that the ground had never been broken and was perfectly raw in every respect.

"A thing that helps materially on a new place is the family cow, chickens and a pig or two. There are settlers here who are making all of their expenses with a couple of cows and a small flock of chickens. They can from the first season raise practically everything they use on the home table from their garden; all kinds of vegetables do splendidly here and they can easily store away in their cellars an ample winter supply. This may be considered by many "small farming" and does not appeal to the man who has been accustomed to raising grain on a large scale, but it is undoubtedly the kind of farming that pays. It requires work—and lots of it, but I do not think that there is any business that offers so sure a reward for one's efforts, and the main thing is that they are building homes where their families may be raised in comfort.

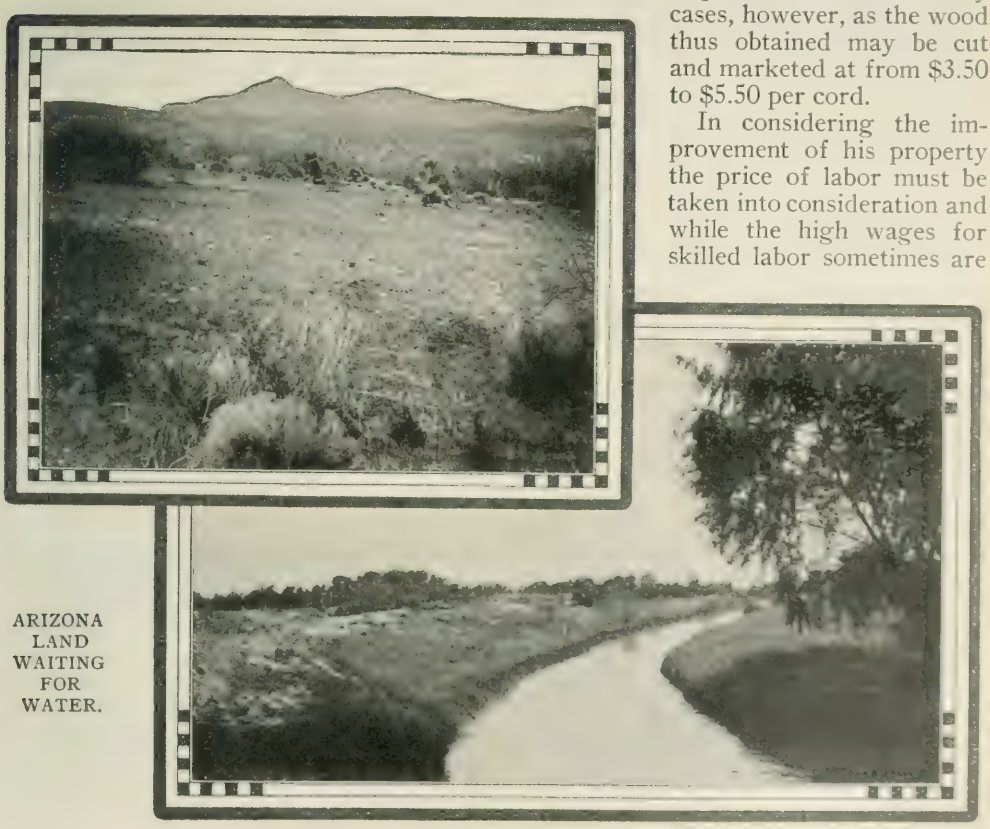
"There is no question but that the

man who has successfully farmed in a district where rainfall was depended upon can make a success in an irrigated section. There are many here who have never had experience in farming and who are making good, and the man with a business training seems to do as well as the old-line farmer."

In many respects this statement applies to most of the irrigation projects, though in each locality there will be various factors which will lessen the cost of some items and increase the cost of others. For instance the price of the settler's home and his fencing would be considerably less in the Northwest. From Klamath Falls, Oregon, comes the report that lumber and other materials used for home building are cheap and abundant, rough pine and fir lumber ranging in price from $12 to $14 per thousand while cedar and juniper posts for fencing cost only ten or fifteen cents each. On the other hand the item of home building would be proportionately greater in the Southwest where all the building materials would be subject to heavy freight charges.

The cost of clearing the land varies in the same way. On some of the projects the land is practically ready to be ploughed and leveled, on others it is covered with sage brush which can be cleared by hitching a team to each end of a heavy railroad rail which is dragged broadside across the country and snaps off the brush close to the ground. This work will cost from $2 to $10 per acre. On still other reclamation projects the land has to be cleared of mesquite or cottonwood, and the stumps extracted. Such work is more expensive, ranging from $10 to $35 per acre. The higher price applies to land that is very heavily wooded, where much grubbing of stumps has to be done. This expenditure brings a partial return in many cases, however, as the wood thus obtained may be cut and marketed at from $3.50 to $5.50 per cord.

In considering the improvement of his property the price of labor must be taken into consideration and while the high wages for skilled labor sometimes are



ARIZONA LAND WAITING FOR WATER.

A SMALL IRRIGATION CANAL.
Water is brought from the Colorado River by means of a [illegible]

IN THE HEART OF THE "DESERT."
Rancher's home on the Gila River, Arizona.

a benefit to the settler, who may be able to earn good wages while waiting for water to be delivered to his dry acres, they are a heavy item of expense for the rancher who has to have his work done.

A statement from Arizona which is fairly typical of the West, gives wages for carpenters as from $4.50 to $5.00 per day, masons and brick layers from $6 to $8 per day, farm hands, common laborers and teamsters $1.25 to $2.00 per day. In fact it is often possible for a prospective homesteader to go into a newly settled section and hire out at good wages, meanwhile keeping his eyes open for a good chance to invest his savings advantageously. In this way he will become familiar with the conditions before he ties himself down to any particular piece of ground.

There are plenty of authentic stories which illustrate the point that in the West a man can carve out a fortune with his hands, if he does not insist on keeping them in kid gloves. Here is one for which I am indebted to Mr. C. J. Blanchard, statistician of the United States Reclamation Service:

Robert McCormick, formerly a lumber-jack at Blue-Earth, Minnesota, landed in Zillah, Oregon, ten years ago with just seventy-five cents in his pocket. For two years he worked as laborer and teamster, and then with his savings made the first payment on twenty-five acres under the Government's canal. It was raw land then, covered with sagebrush. Today it is all in cultivation, and his little farm is bringing him in each year $2,000 above all expenses. Last year he picked 780 boxes of apples from one and one-quarter acres. He has refused $1.25 per box or $975 for his crops which indicates a yield of $780 per acre.

It will be noticed in this simple little narrative how two vital words stick out, "work" and "savings," in fact they might

A NEWLY OCCUPIED RANCH IN ARIZONA.
The dwelling—a tiny cabin—may be seen near the tree in the center of the picture.

A GOOD HARVEST THE FIRST YEAR.
A wheat field in the "desert"

be called the plot of the story. It should also be observed that the "lumber-jack" is a man who takes things as he finds them, expects rough living and no consideration nor favors.

The state of Washington extends an invitation to men like our "lumber-jack" in a booklet issued by the Commercial Club of Odessa.

"While Washington affords opportunities for all who may come, only those who are capable of aiding in the development of the country and making it contribute to their own maintenance and that of others ought to immigrate to it. They are the only persons to be benefited by so doing. The indolent and the helpless will be better off to remain where they are, as they do themselves and the country they locate in, a positive injury by coming to it. But who are those that are capable of assisting in the development of the country? They are such as will bring money into it and use the same in opening up its resources or such as will apply their hands or talent to accomplish that end. The advantage of this state is that all the ground is not occupied and the newcomer may find room to go to work with the certainty of reaping a rich reward for his intelligently directed industry."

It is a long jump from Washington to New Mexico but the same sort of settlers are required to meet the conditions there. The testimonials from homesteaders often throw an interesting side light on the character of the "winners" of the West. Here is one that has a bit of humor which brightens the story of hard work, privation and ultimate success.

"I came here sixteen years ago with a wagon, a team of crippled mules and a sick wife. Now the wagon is worn out, the mules are still crippled, but the wife is strong and healthy. Hope, N. M., is the place for me."

The writer goes on to say that he now has 2,600 acres of land in Eddy Co.,

SETTLERS ARE SATISFIED, AT FIRST, WITH ANY SORT OF COVERING FOR THE HEAD.
This shack is occupied as a dwelling.

New Mexico, acquired by purchase and from the Government under the land laws, valued at $100 per acre and planted with 1,200 fruit trees: the place is stocked with 3,000 sheep, twenty mules, one hundred hogs, milk cows and small stuff. "My house is only three-quarters of a mile from school and church; nearest neighbor an eighth. I raise corn, oats, stock beets, cow peas, fruit and vegetables, together with seventy-five acres in alfalfa, which last year with five cuttings, gave seven tons to the acre."

A pretty good record, that, for the owner of a span of crippled mules, a sick wife and a wagon, presumably held together with baling wire,—but that was sixteen years ago. Assistant Engineer L. E. Foster of the Carlsbad Project, New Mexico, writes that now-a-days a couple of thousand dollars in addition might come in handy. Here is his letter in part:

"Lands are all in private ownership on this project and the average purchase price of $70 per acre must be added to the cost of building a home. The construction charge is $3.10 per acre, payable as provided under the Reclamation Act. The charge for operation and maintenance on this project is $1.35 per acre per annum. Raw land, which can be bought for $40 per acre, can be cleared at an average cost of $10 per acre. A man will need about $1,500 to build a small home and outbuildings, drill a well and fence his property, considering a forty acre tract as the farm unit. A man should come with not less than $2,000 or $2,500 beside enough money to make first payment on his farm which would average about 20 per cent of the purchase price.

"The cost of living is about the same here as at other places in the West."

This last sentence is not explicit, as, of course, the cost of living in the West varies considerably, one of the biggest items being the freight. There is a story going the rounds in Arizona of a miner who broke off a suspender button and not having a shingle nail handy decided to sew it on again. He entered the store and asked for a needle and was told that the price was ten cents.

"Ain't ten cents a little high for a needle?" he suggested as he laid the coin on the counter.

"High!" snorted the store keeper, "you call that high! Why good Lord, man, think of the freight!"

As a result of the high freights the cost of living must be reckoned with on

a pretty liberal basis by the prospective homesteader. From Nevada comes a statement which is fairly typical of the far West:

Lumber is worth $25 per thousand feet, flooring $40; fence wire 4 to 5 cents a pound; flour 3¼ cents, sugar 7 cents; eggs 25 to 50 cents a dozen; butter 25 to 35 cents a pound; beef 7 to 15 cents a pound; hay $8 to $12 a ton, loose; grain $1.50 to $2.50 per 100 pounds; a mower $55, a good plow $17.50; alfalfa seed 17 to 20 cents a pound; potatoes 1 to 2 cents a pound; horses $50 to $200 each; hogs, milk cows, and chickens are not to be had in numbers sufficient to supply the demand.

From the foregoing prices it will be seen that the feeding of a family for a year demands quite a tidy bank account, but just as soon as the farm is on a producing basis the high prices become to the farmer's advantage. The following statement from Arizona applies to many parts of the west, where all the profit goes to the producer instead of the railroads and commission men.

"The Arizona farmer has a good home market. It is a market often directly at hand. The middleman is left out. Here are the mining camps, the mining towns and cities, located in every instance among rugged surroundings where nothing can be grown nor even cows or chickens be kept with profit. Large numbers of people who are well paid must be well fed. The miner pays and pays in coin. These mining towns want all that a farmer can produce. They are mostly permanent, often large and growing, accessible by roads and railroads, and a farm within reach of one of them insures a good income. It is only a question of intelligent management. This is the supreme advantage of the farmer in Arizona. In the nature of things his number is limited; there is no danger of over-production, while his markets are at the door and steadily growing. Farmers in Arizona will get better prices and come nearer having a monopoly of products than in almost any other section of the union."

Among my acquaintances in that newly-created state are a couple of young men who came out West to work in the mines and were alert to just such opportunities. They took up land within ten miles of the camp where they were employed and, having laid by the greater part of their wages for a year, were able to have the necessary improvements made without neglecting their duties. Wells were sunk and sufficient water obtained for irrigation, the land was fenced and a shack built, and these boys who started out as laborers are now owners of valuable property which is capable of producing a good income whenever they care to devote their entire attention to it.

These homesteads were taken up under the desert land laws, under the terms of which no residence is required and the provisions of which are otherwise very liberal. The filing fees for a homestead of 160 acres is $16 for desert entry of 320 acres or of any legal subdivision of 40 acres of same, the entry fees are 25 cents an acre at the time of filing and $1.00 an acre at the time of making final proof which must be within three years. In the meantime $1 an acre must be spent annually upon it.

My friends found no difficulty in complying with the financial requirements, as they were in receipt of wages amounting to between $4 and $5 a day.

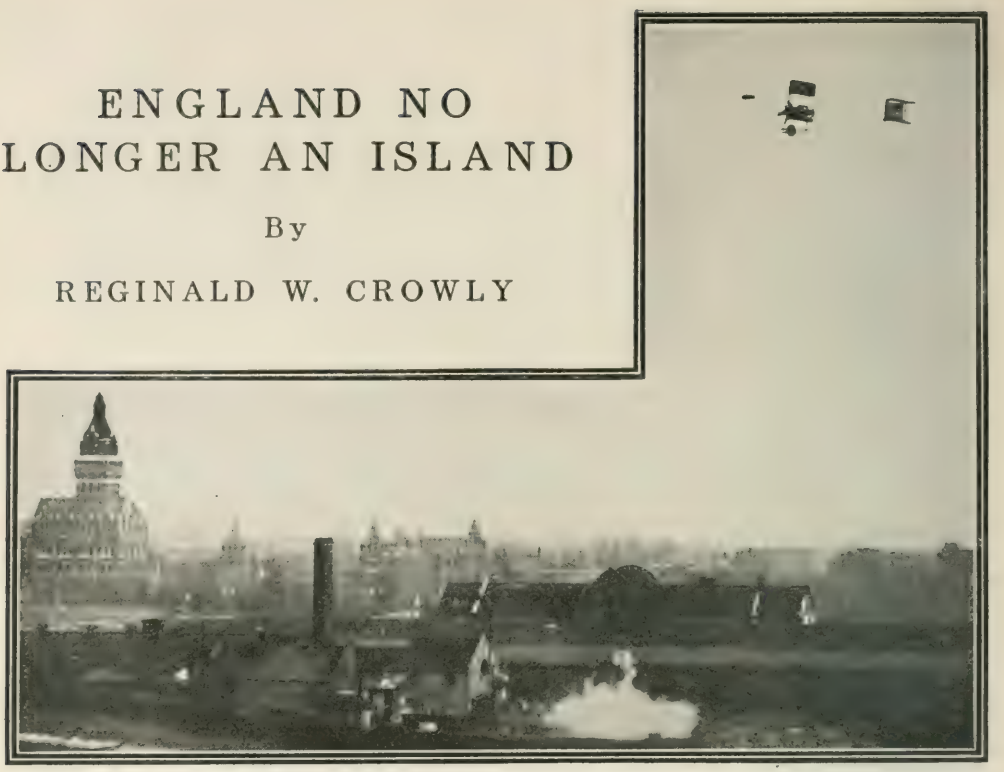
Thus it will be seen that even the man who goes to the frontier without any capital, but who is master of some trade and is willing to work and save, has a good chance of acquiring a stake in the country.

For those who have from $2,000 up there is an excellent prospect of success under the various reclamation projects, and definite information as to the local conditions may be had in each case by addressing the engineers in charge, who are well informed and courteous in responding to such inquiries.

ENGLAND NO LONGER AN ISLAND

By

REGINALD W. CROWLY



M. PAULHAN ARRIVING AT MANCHESTER.
The end of his flight from London.

WHEN Santos - Dumont made the historic hop of twenty-five meters that counts as the first authentic flight in Europe, there was just one man who recognized that this forbode the termination of Britain's isolation. That man was Lord Northcliffe, the principal proprietor of the Daily Mail, one of the most powerful organs of public opinion in England. Looking ahead, he grasped, as none other did, that with the advent of the flying machine there arose the possibility that the sea power of Great Britain might no longer avail. The progress of aviation, he foresaw, could not be arrested, but if he could encourage its development in the United Kingdom he imagined that the means of attack would be turned into means of defense.

So, with a courage and a generosity greater than any he had previously shown, he dedicated $60,000 to the cause of flight in England. For the Englishman who should first succeed in making a circular flight of one mile on an all-British machine he gave $5,000, but the remainder was thrown open to the world, $5,000 for the first flight across the English Channel and $50,000 for a flight from London to Manchester, one hundred and eighty miles, in twenty-four hours with not more than two stops. To have reserved the whole of this money to English flying men or to English flying machines would have further stunted progress that was already slow in Great Britain, because, while foreigners would be developing eagerly and rapidly, a spirit of happy-go-lucky any-time-will-do sort of contentment would be prevailing in England. How accurate his foresight proved is now known. A Frenchman flew across the channel first, and the circular mile prize for an Englishman was won only six months before a Frenchman carried off the London to Manchester prize.

When the Daily Mail first announced

its magnificent prizes there was not a newspaper in England that did not laugh the project to scorn. Apparently not a single person in the country appreciated, as Lord Northcliffe did, how great were the pending developments. Fourteen months' progress from that little hop of Santos-Dumont's saw Farman winning a French prize for a circular flight of one kilometer. Even then aviation was not taken seriously, and when Wilbur Wright went to France in the summer of 1908, the opinion was generally held that his achievements were due more to acrobatic ability than to the design of his machine. Then the news was sprung upon France and England at the end of June last year that Latham, on an Antoinette machine, would endeavor to cross the Straits of Dover.

Latham is a Frenchman for all his English name. He was born and bred in France and, like Farman, is a naturalized Frenchman. With his machine he established himself at Sangatte near Calais, and there for more than a fortnight he waited for favorable weather. England waited, France waited, so long that Bleriot's friends pressed him to proceed immediately to Calais and fly across while yet Latham was waiting. But Bleriot, who was at that time making some astonishing cross-country flights, demurred.

"If Latham fails I will go," he said. And Latham did fail. For he started on the morning of July 19th soon after sunrise, circling over the land to test his machine and rising to a height of 1,000 feet before he crossed the cliff line, and sped after the French torpedo boat which was to escort him. He passed from the view of the spectators on the French shore flying high and well, but he was not yet half way across the Channel when his engine stopped. Planing safely down, he came to rest on the surface of a calm sea, and was picked up by the torpedo boat some minutes later. His machine was salved, being hoisted in davits and dragged into Calais Harbor.

It was then that Bleriot acted. He was recovering from severe burns caused by one of his machines catching fire. He could not walk without the aid of crutches, but he could fly. He did not tarry. Having chosen the ground from which he would rise on the French Coast and selected a meadow where he could alight on the English cliffs, he rose at dawn on July 25th and, undeterred by the haze which hung over the Channel, decided to start. Sending word to the Commandant of the French torpedo boat in Calais, he hobbled to his machine, and, giving the crutches to one of his mechanics, he ordered the engine to be started and flew off immediately.

AVIATION COURSE SET BY LORD NORTHCLIFFE
He has offered a prize of $5,000 to the aviator first making the proposed circuit.

Circling to a great height, he cleared the French coast at 4:35 a. m., and within five minutes was swallowed up in the fog. The compass he had with him proved useless, the needle swinging round and round with the vibration of the engine. But he had no reason for fear because he knew that, with the air-bag which had been fixed in the body of the machine and with the buoyancy of the wings, if he were forced to descend he could keep afloat until he was rescued by the torpedo boat which was near him but which he could not see. It was a trying ordeal, aloft over the Channel, with the land in front of him and behind him hidden, and not a glimpse of the water 1,500 feet below. The suspense of mind must have been great, for the fog never lifted once. As minute passed after minute and the time exceeded twenty-five minutes, he repeatedly imagined that he saw the white cliffs just ahead of him.

Not to catch sight of those cliffs—the white walls of England—in good time would be perilous. Fortune, however, favored him, the fog being slight on the English Coast, so that, some thirty minutes after he had started, the English coast line emerged out of vagueness and took definite form in front of and below him. He was safe. The South Foreland Lighthouse showed him his position, some three or four miles from the spot he had selected for landing. So, bringing his machine around, he went away down the coast until suddenly he caught sight of a large French flag being waved by a solitary figure. Thinking that flag was a signal from his English manager, he struck inland and planed down fast. Only as he came within a couple of hundred feet of the flag did he notice that the signaller stood in a big hollow, with slopes all round. It was too late to rise again, and he had therefore to land immediately, which he did safely, but not without breaking the under-frame as he struck the slope at an angle. Time 5:12 a. m. The man with the flag proved to be the correspondent of one of the leading French papers. He had waved the flag with sheer delight at seeing Bleriot, and had not the faintest idea that the ground on which he stood was about the most unsuitable for alighting to be found in the district. Some time later Bleriot's friends, who had been waiting at the appointed spot some distance away, came running over the cliffs. They found him standing on one leg, leaning on his machine for support. He could not walk owing to his lameness. He was driven away in a motor car, and his wife brought the crutches over by the boat later in the day.

Bleriot's first concern was to cable to Latham, offering to share the $5,000 prize if Latham should cross during the day. He was unable to try till the second day after, however, when he reached a point a mile from the shore of England where his engine stopped, and he came down so close to land that the first boat to reach him was a vedette boat from one of the battleships in Dover Harbor. He had failed again.

Bleriot in His Monoplane Leaving the French Coast on His Flight to England.

For ten months no further efforts were made to cross the Channel by aeroplane. But there was still a prize to be won—$2,000 offered by Ruinart Pere et Fils, a firm of champagne merchants at Rheims. For this prize two aviators entered the lists toward the

end of May of this year. The Hon. C. S. Rolls, the third son of Lord Llangattock, went to Dover with his English-built Wright biplane, while Count Jacques de Lesseps, youngest son of the famous Ferdinand de Lesseps, who constructed the Suez Canal and attempted the Panama Canal, went to Les Braques with his Bleriot machine, occupying the same yard that Louis Bleriot had used on his successful flight the previous year. On one side of the Channel no preparation was needed. Within twenty-four hours of his arrival on the French Coast de Lesseps was up in the air and away, accompanied by a torpedo boat destroyer.

Bleriot in His Cross Channel Flight as Seen from the Deck of the *Escapett*

The morning had opened unfavorably with showers and wind, but in the afternoon the rain squalls ceased and there came a calm. At 3:30 p. m. the motor was started, and at 3:40 p. m. de Lesseps was over the water. The English Coast was wrapped in dense fog and not merely in the haze which he expected as he left France. With great foresight he had previously noted his course by the sun. Those on the English cliffs awaiting him anxiously heard suddenly the unmistakable crackle of the Gnome engine, but it was a full half minute later before they espied him, high up and only vaguely defined. He also, like Bleriot, had come up near the South Foreland Lighthouse, and landed with a long glide because his engine had stopped just as his journey was completed. It had been his intention to go back to France, as he had come, by way of the air. He waited patiently, but the fog got thicker and he had to abandon his object.

There was no prize left for Rolls to gain, at least with the machine he was using. There is still Baron de Forest's prize of $10,000 for the British subject who, with a machine constructed within the confines of the British Empire, shall have flown the longest distance from England to the Continent before the last day of this year. Rolls had a British-built aeroplane, but the engine was of the Wright type built in France, and he was therefore ineligible for any attempt in connection with the de Forest prize.

Having made his preparations for a Channel flight, he was, however, sufficiently keen to attain the object he had in view, even though it carried no pecuniary reward. He was unfortunate with engine trouble at first, and he broke wood during a trial flight. This delayed him, and it was not until June 2nd that he was able to set out from England on his flight. He had a fine clear day, calm and ideal. Flying very high, he crossed the French shore line at just about the point where de Lesseps had started eleven days previously, and having dropped three letters to the French Aero Club, he turned around and made for England again. After circling around Dover Castle, he alighted smoothly near his shed, having been in the air one hour thirty-five minutes.

Rolls' accomplishment stands above those of de Lesseps and Bleriot, for he did it as a sportsman and not as a prize-seeker. Moreover, he had no escorting boats, and if he had had to descend in

GRAHAME-WHITE'S DESCENT AT LICHFIELD, SIXTY MILES FROM MANCHESTER.

mid-Channel he would have had to wait there for a considerable period. He had provided himself with a life-jacket, and air-bags were attached to the machine of sufficient capacity to keep it afloat if necessary. The prospect of a dip in the Channel and a long wait before rescue, had, however, to be faced, with attendant discomfort even if the danger were not great.

Harking back twelve months, to the first aviation meeting at Rheims, it was made evident so long ago as August of last year that the London to Manchester flight was within the grasp of flying men. Farman there flew for more than three hours, covering 112 miles, a performance that came as a surprise even to those best acquainted with the progress that aviation was making. At that same meeting a previously unknown flying man worked his way right to the front. Nobody knew Paulhan before, but Paulhan on a Voisin machine flew for only twenty minutes less than Farman. Paulhan's name was made. From the prize money he gained he purchased a Farman machine, and shortly afterwards, at Blackpool in England, he proved himself to be not only a skillful and prudent aviator but also an intrepid one. Much was made of Latham's flight in a strong wind at Blackpool, but Paulhan did equally well and yet did not get credit for it, because he was not then a popular idol. Paulhan's skill and earnestness had, however, been noted by some, and he was engaged to fly at the Brooklands Motor Track. There he set up both long-distance records and height records for England.

Early in the new year an English aviation school was advertised to have been formed at Pau by one of the name of Grahame-White. Instruction was given in the handling of Bleriot machines, and a fair number of Englishmen, and an English lady too, were attracted there. But Grahame-White performed nothing startling, and his name was mentioned only when he happened to fall from a height of sixty feet without injuring himself. In March he went to the Farman school and there had his first experience with biplanes. He showed rapid progress, and early in April sent in his entry for the London to Manchester prize and announced his intention of starting as early as he could possibly do so. His new Farman ma-

chine was brought over from France in sections and erected in a hotel yard on the outskirts of London. From there he rose without a trial flight soon after 4 o'clock on the morning of April 23rd.

A slight haze lay over the country and he was soon lost to view, proceeding in the direction of London, where he had to cross a line drawn with a five-mile radius from the Daily Mail offices. That section of the journey was not the least daring, for it carried him over the tall chimneys of many factories and over a huge gas-works where an official stood on top of a gasometer and waved a white flag to him as the five-mile line was crossed. Turning, Grahame-White then made off for the North Western Railway Line, which affords practically the most direct route from London to Manchester. He soon picked up his bearings, for at all crossings and junctions the North Western Railway had permitted the sleepers to be whitewashed to indicate the direct course. It was a bitterly cold morning, with a sharp wind from the north piercing the early spectators to the marrow. When London awoke, it learned that Grahame-White had descended about eighty miles from London, half frozen, with hands benumbed so that he could scarcely control the operating levers. He had come down at an appointed spot to take on more gasoline.

From there onwards his progress was slow against the breeze and when he had proceeded some thirty miles he deemed it prudent to descend, being caught in strong gusts of wind blowing from various quarters, and at times dropping vertically thirty feet or more in spiral columns of air. At Lichfield Grahame-White stopped at 10 a. m. waiting for the wind to fall. He had still until 4 a. m. on the following morning to complete his journey. The wind grew in strength, and the rain came down, so that even at sun-down, when aviators often find the wind abating, he could not start.

Leaving the machine to the care of his friends, he retired in the evening to rest, but his friends were faithless to their duty and about midnight a gust of wind caught the machine and blew it violently over on its side, smashing the planes. Early next morning the wrecked machine was put on the train and taken back at

THE HON. C. S. ROLLS IN THE AIR AT DOVER
He crossed the Channel to and Fro

ALL IN READINESS FOR AN OFFICIAL TRY-OUT.

express speed to London. Mechanics worked day and night under the guidance of Farman, the designer and constructor of the machine. They knew that Paulhan was ready to hasten to England when Grahame-White should fail. And now Paulhan was coming—Paulhan, who had never yet made a mistake, had never had the slightest accident with a machine, and who had come to be recognized as the most skillful of all the European aviators. While Grahame-White's men worked feverishly to repair the damage, Paulhan's machine was brought over from France, and after several annoying delays, reached its shed outside London early on the morning of April 27th.

At Wormwood Scrubbs, Grahame-White made an attempt to start when repairs were completed but was forced down by the wind.

At Paulhan's shed some miles away the work of erecting the Farman biplane was completed at about five o'clock in the evening. Paulhan would not state

HOW THEY HONOR THE AEROPLANE IN FRANCE.
The *Blériot XI* on its way to a flight.

what his intentions were, but after affectionately embracing his wife he ordered his engine to be started and after a short run left the ground. He headed for London to cross the five-mile line over Hampstead Cemetery, then turning he struck the course of the North Western Main Line, where the whitewashed sleepers that had been prepared for Grahame-White indicated the course to him. In a few minutes he caught sight of a train beneath him from which signals were being made to him. It was a special train in which were his wife and friends. It had been waiting all day with steam up, and Grahame-White's friends had not heard of it. As the so-called Englishman, Latham, had been caught napping when Bleriot started across the Channel, so on this occasion the real Englishman, Grahame-White, was caught literally fast asleep.

When he was aroused and hurried away to the shed where his machine lay, he found the wind no better than it had been earlier in the afternoon. But he simply had to go; Paulhan was already an hour ahead of him, so with a heart that must already have been faint, he sped aloft and around over the gasometers to follow Paulhan. The Frenchman had slightly the faster machine, a later type than that of Grahame-White's, but the advantage was negligible. It was obvious that both men would have to descend soon after 8 p. m. when it would be dark. And this occurred, Paulhan descending by a curious coincidence at Lichfield, where Grahame-White had been balked at his first attempt, and Grahame-White himself alighting on this occasion some thirty miles behind.

Then came the most heroic incident yet recorded in the annals of flight. After some rest at a hotel, Grahame-White, with the courage of desperation, went down to his machine at three in the morning, while it was yet dark. Hurriedly making an examination by the faint glimmer of a few farm lanterns, he scrambled into his seat, told assistants to start the engine and shouted "Let go." He was in a field not 100 yards square, and the hearts of the spectators leaped into their mouths as the spectral machine glided away. They listened intently and heard only the regular crackle

THE LONDON TO MANCHESTER FLIGHT.
M. Paulhan, who won fame in this flight, starting from London.

of the engine—no crash. He was safe: he had cleared the hedge and the trees beyond; but they rushed across the field to reassure themselves. He was gone. A powerful motor car with brilliant headlights was racing over the road to guide him. Aloft in the obscurity he could see nothing else, only here and there a patch darker than the rest,—trees or houses, perhaps.

As soon as it was light, Paulhan was at the side of his machine. The light from the lamps was just fading as the dawn broke in a cloudy sky, but what was that news from the signal-box close by? Grahame-White? Flying? Only seven miles behind? But Paulhan was confident as he started for he had a faster machine. The wind was blowing strongly, and it was evident that the strain of flying on that morning was

COMTE DE LAMBERT ASCENDING FOR HIS TRIAL TRIP AROUND EIFFEL TOWER.

great. Even Paulhan—the great Paulhan—was steering an erratic course as if seeking to avoid strong winds. Now rising, now falling, he made his wife and friends fear for his safety. It was plainly a great battle with the wind. Onwards he flew, gaining sped over the special train, which was checked once or twice at junctions.

Though Paulhan did not know it, Grahame-White had descended, and there was no longer a struggle between man and man but only between one man and the wind. The last seventy miles to Manchester were covered in something over an hour and a half, and then Paulhan descended through a ground mist by the side of the railway, within five miles of the Manchester office of the *Daily Mail*. The prize was his—$50,000! He was so cold and so exhausted by the strain of the battle with the wind that he had to be assisted from his seat and led to the railway station. The prize had been hard earned, and Paulhan frankly avowed that but for fear of Grahame-White he would never have flown in such a wind.

Grahame-White, though he had lost, had lost gallantly. The daring and hazardous flight through the dark must have told on his nerves. Just at that hour of the morning man's courage is at its lowest ebb, so much so that Napoleon would never have his men on the march at that hour. Grahame-White also found his speed reduced by the wind getting between the two surfaces of the fabric on the tail of the machine, the wet having loosened the fabric and allowed the joints to open. Against this combination he could not fight, and he had descended before even Paulhan rose on the last stage of the journey, the gap having been reduced to seven miles.

In these contests the English were beaten all around, but Lord Northcliffe's great object had been attained. The nation had been awakened and no longer showed apathy towards aviation, but great enthusiasm. The flights of Paulhan and Grahame-White over the big towns that lie between London and Manchester had shown to millions the greatest marvel of the age. They never had seen a flying machine before. They believed it capable of flying in calm

weather, but having seen two machines flying over them faster than the railway train on the tracks, they were convinced of the future of flight. Through wind and rain—and both are plentiful in the sea-girt island with its valleys leading towards the Midlands where the currents meet and blow in every direction—these two machines had accomplished flights that surpassed all others not only for the distance flown but also on account of the difficult nature of the country over which they passed. There is no country in which flying from town to town is more difficult than in England, no country so populous, no country with such variable atmospheric conditions.

Lord Northcliffe's generosity to aviation has, however, not been exhausted. He has offered another prize of $50,000 to be competed for during the second week of July next year. It is to be an open competition around a circuit of England and the Lowlands of Scotland, a distance of 1,000 miles. The winner will be the one who completes the course in the shortest time. May it be won by the best man, be he Briton or any other!

Song of the Western Men

A good sword and a trusty hand!
And merry heart and true!
King James' men shall understand
What Cornish lads can do.

And have they fixed the where and when?
And shall Trelawney die?
Here's twenty thousand Cornish men
Will know the reason why.

Out spake their Captain brave and bold,
A merry wight was he;
"If London Tower were Michael's hold,
We'll set Trelawney free!

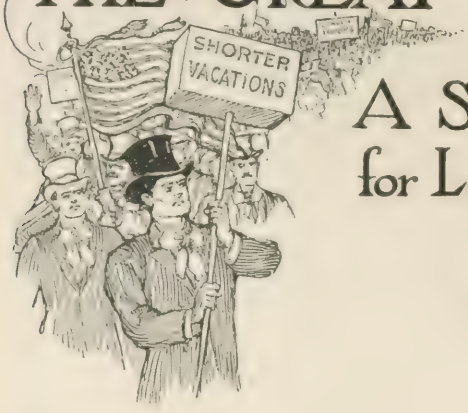
"We'll cross the Tamar, land to land,
The Severn is no stay;
With 'one and all' and hand in hand,
And who shall bid us stay?

"And when we come to London Wall,
A pleasant sight to view,
Come forth! Come forth, ye cowards all,
Here's men as good as you!

"Trelawney he's in keep and hold,
Trelawney he may die;
But here's twenty thousand Cornish bold
Will know the reason why!"

—Robert Stephen Hawker

THE GREAT GIFT of WORK



A Story of the Strike for Longer Hours of Labor

By Henry M. Hyde

THOUGH Esau G. Cartwright died less than a hundred years ago he has already become a mythical figure. It is written of him that when, at the age of a hundred and twelve, he finally yielded his last breath, hardly one of the organs which made up his decrepit body had originally belonged to him—that arms and legs, eyes, stomach, hair and arteries had all been filched or purchased from some other man or animal. He has been described as a weird patchwork of diverse mechanisms all skillfully brought into gear with the marvelous brain which always set Cartwright apart from and above his fellows.

As a simple matter of fact, when old Cartwright came to the end the great research institute which he founded had just begun the wonderful work in surgical grafting which now makes it possible—if no longer legal—to prolong human life indefinitely. It is, to be sure, true that in his ninety-sixth year, his right arm being entirely crippled with rheumatism, he found a lusty young emigrant to whom a hundred thousand dollars was full recompense for the loss of everything below his right elbow. But that was one of the first cases of limb grafting on the human subject and, though it was on the whole successful, it had some curious and embarrassing results. The muscles of that new and illiterate right arm had to be trained to write. Once the trick had been mastered and bank cashiers had become familiar with the revised signature the new right hand showed an alarming willingness to sign checks, which required constant watchfulness on the part of its present owner. Heretofore Cartwright had been distinguished by a suave and cautious diplomacy in dealing with those who attacked him. Now, when provocation offered, the bellicose right fist doubled itself up, threateningly, and Cartwright earned a new reputation as a man of domineering, not to say, violent manner.

It is also truthfully recorded that when the sight of Cartwright's left eye became obscured, the cornea of a rabbit cleared up the world for him. Otherwise he died as he was born—so far as his physical make-up is concerned—except for the cellular changes which, in the natural course of life, make a man over every seven years.

Cartwright's real work in the world was to furnish funds for hastening the evolution of human society. In that he was as much an unconscious instrument as any lesser man. And it is more than doubtful, had he really possessed the prophetic foresight which folk lore ascribes to him, whether he would have poured out his money so freely. For, whatever his faults, he sincerely believed that the work he was doing would make for the happiness of the human race. He died, of course, bitterly disappointed, in the midst of chaos, without getting even a glimpse of that Utopia which is not even yet entirely attained.

Cartwright was the first among men

to monopolize one of the great, natural resources of the world. He chose oil, because of the expensive and complicated machinery required to handle and refine the raw product and make it ready for the market. In the splendid struggle to make his control complete he sent wagons carrying kerosene for lamps into the most remote corners of the country. And, as he thus gathered quick millions of dollars, he necessarily and at the same time, made reading a universal habit among the people of the United States.

In the old days it took the mighty will of a Lincoln to walk ten or twelve miles, after a hard day's work, to borrow Euclid, Shakespeare or the Bible and, still later, to spend the midnight hours, stretched on the puncheon floor, painfully spelling out the pages by the light of a flickering pine knot. Now, thanks to the business genius of Esau Cartwright, a kerosene lamp blazed in every hut and a flood of cheap magazines and cheaper newspapers filled the universal mind with undigested thought and vague ambition. Cartwright, as near omniscience as a man may be, was the first to sense the popular unrest. He had already covered the country with a wonderful organization which, as he fondly conceived, was able and ready to meet any emergency. Sitting at the center of the web he called in his publicists and educators and laid the case before them. From their united counsels came the sage message that a little learning is a dangerous thing. The people are upset by casual and superficial misinformation and ignorant or malicious instruction. The way to quiet them is to make their knowledge sounder, their perception clearer, their advisers more rational and lucid. With the courage and decision which marked him, Cartwright acted without delay. In every village he set up and endowed a free public library. In half a dozen great centers he established universities, with faculties of learned men gathered from all over the world. At the start the effect was tremendous. Young men and women, eager and ambitious, flocked to his universities. Children and adults passed in swarms in and out of the marble palaces which housed the Cartwright libraries. The name and the fame of Cartwright was blazoned in every one of the cheap newspapers. The cheap magazines printed stories of his life and photographs of him in a hundred attitudes. A thousand babies were given his inspiring name. Journalists secured and printed his views on every conceivable topic. Being, after all, but human, Cartwright presently—and quite unconsciously—began to lose all sense of his finite limitations. The splendid self-confidence, which had always marked him, degenerated into a swollen and diseased self-satisfaction and conceit. There was no subject on which he did not offer a final opinion, carelessly contradicting, if so it happened, men who had given their lives to the study of the question at issue.

Taking advantage of the public absorption in the higher education, Cartwright's business organization made good its hold on the rivers of the country, putting in hydro-electric power plants at a thousand water-falls and spinning a web of transmission wires which brought plenty of cheap power within reach of every village and almost every farm. At the same time, by way of putting a gag in the mouth of critical clamor, he voluntarily reduced the period of work in every one of the Cartwright enterprises to six out of each twenty-four hours. And so irresistible was the Cartwright influence that, within a year, the six hour day became almost universal. The few who clung to the old eight hour schedule were denounced as reactionaries, while the chorus in praise of Cartwright rose to a higher pitch.

Then as unexpected as a bolt from the blue came a swift reaction. Strangely and painfully enough it was apparently begun by certain of the professors in the universities which Cartwright, himself, had endowed. They delivered lectures and wrote books attacking the methods of their benefactor and each of the university towns became a center of destructive fanaticism. The old man's council of educators and publicists gave the matter profound consideration and came to the conclusion that the disaffected professors were the victims of their environment. They were brilliant men, working for salaries which barely met the cost of living, and they were driven into dissatisfaction and revolt by the facts that their tenure of office was

uncertain and they were unable to make any provision for a comfortable old age. An assured life income, it was pointed out, is almost always a convincing argument with which to silence radical theorists. Promptly Cartwright set aside a hundred million dollars in water power bonds, the income from which was to be used in paying life pensions to university and college professors, who might be retired, either voluntarily, after twenty years' service, or at any time, by the vote of their colleagues in the faculty. So admirable were the results from this benefaction that it was followed, presently, by the appropriation of a sum twice as big for the payment of pensions to public school teachers under similar conditions. Nor did Cartwright and his advisers even attempt to put any limit on freedom of thought or of teaching in school or colleges. They relied, simply and wisely, on that universal provision of nature which prevents all but the most ungrateful dog from biting the hand which feeds it.

Side by side with this beneficent distribution went on, at the same time, Cartwright's great work of developing the hitherto unused forces of nature and compelling them to take the place of human labor. Out of one of his great experimental departments came finally a practical and efficient motor by which all the power of the ocean tides, rising and falling under the pull of the moon, could be usefully employed. In other experimental rooms were developed a hundred ingenious devices for putting this new power to work in the place of men and

HE COVERED THE COUNTRY WITH A WONDERFUL ORGANIZATION.

women. Thus it was easy to cut down the average hours of labor without reducing the output and in all the Cartwright business enterprises the five hour day was presently instituted. At this point the malign influence of the labor unions was felt. By bringing pressure to bear on certain state legislatures they were able to make working more than five hours a day illegal. Both fine and imprisonment were provided for violation of the new law and in at least one Western state serious complaint was made that the state constabulary, charged with its enforcement, not only interfered with personal liberty, but did not enforce the law equally, accepting bribes in some cases to permit certain favored individuals to work longer than five hours out of twenty-four.

For this unfortunate development Esau Cartwright did not feel himself at all responsible. However much he might regret, he had never been able to control the action of such bodies of irresponsible and undisciplined men. The problem was given long consideration by the Cartwright councils and it was finally decided to attempt to break down the spirit and strength of the mob by appealing directly to the individuals who composed it. Cartwright had long before established a great fund for the giving of gold, silver and bronze medals and sums of money to people who could prove that they had played the part of heroes. This had, on the whole, worked well, though once or twice a worthless individual had been detected jumping into the water to give an equally worthless confederate a chance to win a new stake by rescuing him at great apparent risk of life.

Now Cartwright decided to make the application of his idea universal. He set aside a vastly greater fund, the income of which, it was announced, would be used in paying pensions to every man, woman and child who could convince a committee of experts that he had done his whole duty during the previous twelve month. The decisive argument which led to the creation of the duty fund was that if each individual seriously gave himself to the work of doing his own duty he would have no time or energy left to attend to the business of other people.

These endowments, of course, made great demands on the resources of even such a man as Esau Cartwright. Fortunately he was easily able to meet them because of the fact that his associated inventors and scientists had meanwhile found means of utilizing the interior heat of the earth in the production of limitless amounts of power. By boring, with their newly devised apparatus, twin wells down for a few miles through the skin of the planet, to a point where the permanent temperature is several hundred degrees above zero, they were able to turn a small river into one well and to get from the mouth of the other a perpetual and unlimited supply of high-pressure, super-heated steam, sufficient to do practically all the hard work of the world. Continually repeating the process of inventing labor-saving machinery they maintained—even increased—the production of every useful commodity, while at the same time they reduced—by way of stealing the thunder of the labor-unions—the regular hours of labor to four each day, thus giving to every citizen each afternoon and all day Saturday and Sunday off, with sixty days full vacation, with pay, annually.

In the chorus of acclaim which greeted the establishment of the duty fund Cartwright and his associates for the instant lost sight of the fact that the labor unions were steadily pressing forward their nefarious plans. Before Cartwright fairly awoke they had forced the passage of laws in every state, making it a crime to work more than twenty hours a week and fixing solitary confinement for five years at hard labor as the least penalty.

If the great man had been instantly able to concentrate all his tremendous energy on this situation all might yet have been well, but the great practical difficulties found in the administration of the duty fund first claimed his attention. Here for the first time real differences of opinion developed in Cartwright's inner councils. His experts not only disagreed, but violently quarreled, as to what actually constitutes the whole duty of man. Religious questions entered into and lent bitterness to the controversy. The affidavit of no single applicant for a duty pension was left unquestioned by his neighbors. In every community there

were as many warring factions as families. Afternoon bridge parties, to which the wives of the lower classes now devoted their attention, commonly broke up in pitched battles. In the prohibition states — now numbering forty-nine — the intemperance and violence were especially noticeable. For the first time in his life Cartwright began to lose his self-confidence.

For the first time, also, he willingly listened to the advice of the aged and infirm statesman who fifty years before had started Cartwright on his career of beneficence by calling him a malefactor of great wealth. With vocal organs still strong and flexible from constant exercise during the long period of his retirement, the venerable sage of Oyster Bay vehemently urged that the two great evils which still threatened the perpetuity of the republic were race suicide and the prevalence of divorce. With these eradicated all would yet be well.

THE CRAFTY LABOR UNIONS . . . SECURED THE ADOPTION OF AN AMENDMENT TO THE CONSTITUTION.

Willing, as are all truly great men to admit and correct a mistake, Cartwright acted with his usual practical and far-sighted business sense. In the advertising pages of every magazine and paper in the country, he spread the announcement that the duty fund had been withdrawn. The same amount of money, he went on, would thereafter be devoted to the payment:

First: Of one hundred dollars to the mother of each child born in the United States.

Second: Of one hundred dollars to each family which should produce on January 1, the joint affidavit, sworn and witnessed, of husband and wife, setting forth that they had lived together without bickering or quarrel during the previous year.

Meanwhile the crafty labor unions, concentrating their influence on Congress, secured the adoption of an amendment to the Constitution, fixing forever four hours as the maximum length of a day's work in all the territories of the United States and the passage of a law absolutely stopping immigration from any quarter of the globe.

The first effect of the anti-race suicide fund was to entirely depopulate the orphan and foundling asylums. It also unfortunately resulted in serious charges of grafting against certain members of the medical profession. It was in fact proved against one physician that he had been induced to issue three birth certificates in a single year to one family of his acquaintance. But, as Cartwright reflected, that was a matter which would cure itself. In the course of three or four years he felt certain that the beneficent results of the endowment would make itself felt.

The anti-divorce fund, in its practical working, also presented, in the beginning, certain puzzling features. While divorce promptly took its place with appendicitis, as a disease of the idle rich, entirely disappearing among the almost equally idle poor, there was a strange and disquieting increase in the number of convictions for wife beating and other uxorious crimes and misdemeanors. But that, also, Cartwright felt might be left to work itself out.

He was vastly more puzzled and distressed by the strange new tumult and confusion which continually embroiled the body politic. In every community on every afternoon great crowds of men and women came together to discuss and debate as many different questions. And as everywhere, under the operation of the various pension funds, more and more people were relieved of the necessity of even the four hours' daily labor, the noisy and disorderly afternoon meetings were more and more often super-

seded by all day sessions, which too frequently ended in riotous outbreaks of violence.

Eloquent leaders arose who led strange, new crusades and found it easy to gather thousands of enthusiastic followers in almost any cause. Among the most successful of such was the famous Dr. Grayson, who preached total abstinence from manual labor of all kinds as the only creed worthy of enlightened spirits and who, after enlisting several million zealous converts, finally died of apoplexy as the result of overeating at a raw food banquet given in his honor by the Sisterhood of Emancipated Cooks. Another conspicuous figure during this stormy period was the Kansas amazon, Clarice Ethel O'Brien, who finally demonstrated the superiority of her sex by leading her female base ball club to the defeat, in a series of seven games, of the Chicago Cubs, then still the champions of the National League. Miss O'Brien presently married the umpire, it will be remembered, and lived to a ripe old age on the proceeds of a pension of $5,000 a year which her devoted husband had no trouble in securing from the Cartwright hero fund.

But these were mere figures of mirth among the more serious and dangerous

HIS LAST DESPERATE GIFT.
The endowment of government of the United States with practically his entire fortune.

agitators who at that time kept the whole country in an uproar. Most threatening of all was the great secret order formed for the abolishment of all taxes and which before the watchful Cartwright suspected its existence had enrolled perhaps a majority of the people in its ranks. Then—and on the same day,—disorder flamed into open violence in a dozen widely separated parts of the country. Tax assessors were hanged in effigy and even—in two instances—in their proper persons. The militia was ordered out and the governors of three states called upon Washington for assistance.

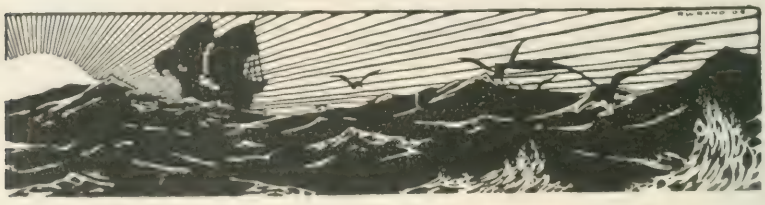
It was then that Cartwright lost his head. For once he refused the advice of all his friends and experts and took counsel only of his fears. He issued a last, pathetic announcement to the public in which he set aside practically all of his enormous fortune—upwards of fifty billion dollars—as a permanent endowment fund for the government of the United States. The deed of trust provided that in case the income was greater than the present needs of the government the surplus should be divided among the states in proportion to the population.

For a time the magnificence of the conception and the enormity of the gift left men breathless. Then from the smallest of the states came a voice of earnest and indignant protest. Never, it declared, should the gift be accepted if, by so doing, the operation of the tariff should be interfered with. If a tariff be no longer necessary for revenue it was declared, let it remain for the protection of the American workingman and for other good and sufficient reasons. From a hundred other states and cities rose cries of angry denunciation. The National Association of Internal Revenue Collectors and a dozen similar bodies passed heated resolutions. The people everywhere spent their afternoons and evenings in writing petitions to Congress. The former chaos became worse confounded.

The first clear and sensible suggestion came from a young man in Chicago, who was connected, in an honorary capacity, with one of the labor unions. In the beginning his ideas met with no response. But gradually, as he made his points clear, the people grasped their truth and rallied round him with desperate earnestness. At his instance a universal strike was called, in which men and women of all kinds took willing part. Finally came that memorable day, when at the head of a million men he stood before the capital at Washington, bearing, also, petitions signed by practically all of two hundred millions enlightened people.

Never before did an army march under such banners. "Longer Hours" and "Shorter Vacations" were the legends they bore and at the head of each petition was written the single demand: "Give back to the people equal opportunity and the great gift of honest work."

Old Esau Cartwright, as has been stated above, died before the strike was settled. He passed away an unhappy and disappointed man before ever the new day—which is also and always the old—dawned in the eastern sky.



AFTER A BOILER EXPLOSION.
Scene at Robinson, Ill., April 14, 1910.

WHEN THE BOILER BLOWS UP

By

CHARLES FREDERICK CARTER

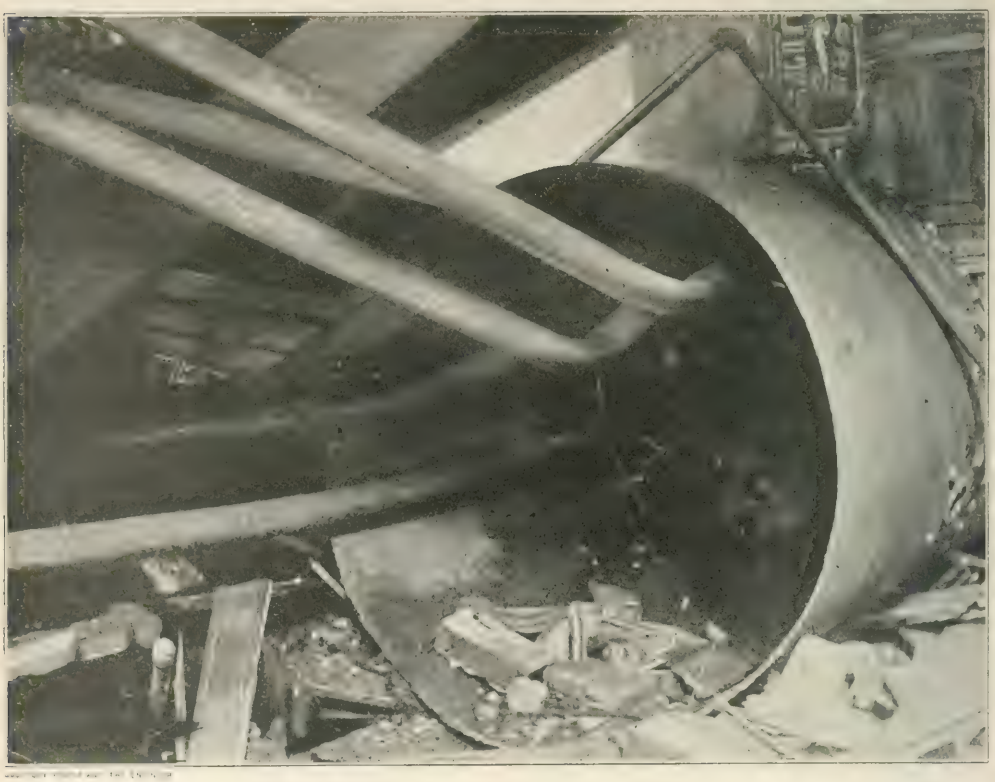
NEWSPAPER editors who revel in gore, as most of them do if their taste is to be judged from the character of the news they allow to get into print, are strangely overlooking a most prolific source of first page "stories;" to-wit, the steam boiler. It is rare, indeed, that the most omnivorous newspaper reader runs across an account of a boiler explosion with its accompanying loss of life and destruction of property. Yet wherever there is a boiler, be it but a humble hot water heater in an obscure flat house, there is a potential news item. And these possibilities materialize more frequently than any one but the boiler insurance companies realize. Even they scarcely have time to grasp the full significance of the deadly boiler's powers of destruction before they are driven into bankruptcy by the frequency of their losses.

Nobody will ever know how many boilers blew up in the United States in 1909, but any one who will take the trouble may learn that at least 550 of them did. That is at the rate of an explosion for each sixteen hours and six minutes in the year. In these 550 boiler explosions 227 persons were killed outright and 422 others were injured. Considering the modest and unobtrusive way in which the slaughter goes on this is a pretty good score.

There is one class of boilers, and one only, concerning which official statistics exist, and even these figures are incom-

plete; this is the locomotive boiler. For reasons sufficiently apparent, Congress and the legislatures regard the railroad as the one work of man that stands in need of especial governmental supervision and control. Hence, the Interstate Commerce Commission is able to announce that from July 1, 1904, to June 30, 1909, 265 persons were killed and 3,656 were injured in explosions of locomotive boilers; was 19.3 per cent of the total number killed in explosions, and 60 were injured.

Saw-mills, which have a pretty hard reputation in such things, only scored 34 explosions; but then saw-mills are not nearly as numerous as locomotives. There were 45 persons killed in these accidents, which was one more than was credited to the locomotives, and 41 were injured.



A BAD "BLOW-OUT."

but not even the Interstate Commerce Commission knows how many boilers were blown up to accomplish this result.

From unofficial sources it may be learned that in 1907 there were 57 locomotive boiler explosions, which means that one out of each thousand in use that year blew up, killing 101 persons, or nearly one-fourth of the total killed in boiler explosions that year, and injuring 68. In 1909, there were 42 explosions of locomotive boilers, which was 7.6 per cent of the total number of explosions, in which 44 persons were killed, which

Those who can read of these disasters on the railroad and in the saw-mill with complacency may have their equanimity disturbed upon learning that the greatest number of explosions credited to any one class of boilers in 1909 occurred in heating apparatus. No fewer than 68 boilers used in heating office buildings, churches, theaters, schools, asylums, homes, apartments and private houses blew up in the course of the year. This, it must be remembered, is not given as the complete total but only as the number known. Only 10 were killed and 18 in-

COURTESY POWER AND THE ENGINEER.

WHERE STEAM'S WRATH DESTROYED A BUILDING.

jured, but surely the angels must have been on guard to prevent some fearful slaughters. For instance, a boiler directly under the dining room of the Windermere Hotel in Chicago blew up January 21, 1906, killing a woman guest and doing $25,000 damage. The explosion occurred at 5:33 a. m. Had it occurred during the breakfast hour dozens would have been killed, for the dining room was totally wrecked. Again, forty girls were about to march into a room in St. Joseph's Orphan Asylum in Philadelphia when a cast iron heating boiler under the room blew up, completely wrecking it. A moment later and that explosion must have resulted in heavy loss of life. On May 11, 1909, a heating boiler in a school at Centralia, Penn., blew up. There was a panic in which a number of pupils jumped from second story windows yet none was seriously hurt. A St. Paul doctor and his family of five were just about to enter the dining room of their home for breakfast when a heating boiler beneath blew up, wrecking the dining room completely and nearly demolishing the house.

As for property destroyed in these explosions of heating boilers only a few fragmentary figures are available. One apartment house boiler explosion in Chicago last year caused a loss of $10,000; another $5,000. The explosion of a heating boiler at Toronto caused a loss of $50,000. A boiler in a private residence at Sandy Hill, New York, blew up, starting a fire which destroyed the house. A heating boiler explosion at Park City, Utah, December 12, 1909, started a fire which caused a loss of $26,500. Another fire starting in the same way in the same month in a private residence in Milwaukee did $18,000 damage. A boiler explosion in a Kansas City office building December 6 caused a loss of $47,500, without the aid of a fire.

From the foregoing it may be seen

A VERTICAL TUBULAR BOILER EXPLOSION AT WEST READING, PA., THAT COST FIVE LIVES.

that no section and no class is free from the menace of the boiler. Wherever water is confined with a fire beneath it there is danger. Why, an insignificant little boiler used to run a steam mangle blew up in the Ideal Laundry in Chicago September 22, 1906, injuring three girls. The boiler in F. A. Dennett's steam automobile blew up at Manitowoc, Wis., June 28, 1909, destroying the auto and injuring the owner. Some boys at play in Iuka, Miss., October 30, 1909, started a fire in a small unused boiler without permission. It blew up, killing one of them and scalding three others severely.

Boiler explosions sometimes have strange results. Thus, a Santa Fe locomotive which blew up at Pinole, Cal., September 29, 1906, started a grass fire which nearly destroyed the town. The plant of the Edison Company at Grand Rapids, Mich., achieved the unprecedented distinction of two different boiler explosions, a few hours apart, on the same day, August 28, 1909.

Generally speaking, there is nothing left to blow up after one explosion. At Lynn, Mass., December 6, 1906, a boiler blew up, starting a fire which destroyed property valued at $500,000. The accident occurred a few minutes before 7 o'clock in the morning when there were but 20 persons in the building. Of these 17 were injured. Generally the consequences are more serious.

One boiler in a battery of ten at Swift's packing house in Chicago blew up November 29, 1902, killing 13 men and injuring 20. Seven boilers exploded simultaneously in the Geyser Avenue plant of the St. Louis Traction Company December 21, 1903, killing 8 and injuring 21 and doing damage estimated at $75,000.

One of the boilers on the Delaware River steamboat City of Trenton blew

COURTESY HARTFORD STEAM BOILER INSPECTION AND INS. CO.

BOILER EXPLOSION THAT OCCURRED WHILE LOCOMOTIVE WAS DRAWING TRAIN OF PASSENGER CARS.
This disaster was at Walla Walla, Wash., March 7, 1910. The fireman was badly injured.

up in 1907, hurling the main upper decks into the river, killing 27 persons and injuring 50. A boiler in the U. S. gunboat Bennington blew up while the vessel was lying at anchor at San Diego, Cal., July 21, 1905, killing 62 men outright and wounding 40 out of a crew of 197. Three boilers in a battery of seven at the mills of the American Tin-Plate Company at Canton, Ohio, exploded May 17, 1910, killing 14 and wounding 30.

The most terrible disaster in the history of transportation on river, sea or land was the boiler explosion on the steamboat Sultana on the Mississippi River a few miles above Memphis about 3 o'clock on the morning of April 27, 1865. The Sultana was going up the river with 1,866 Union Soldiers, of which 33 were officers, who had just been released from Confederate prisons. She also carried 70 cabin passengers and a crew of 85, making a total of 2,054 on board. The boiler, which had been patched a few days before, blew up with fearful violence, killing many outright and hurling others into the river to drown. The boat took fire immediately after the explosion and was completely destroyed. Of the soldiers on board 1,101, including 19 officers, lost their lives and 137 of the other passengers and crew were also killed, making the total death roll 1,238.

It is often said that one cubic foot of boiling water under pressure equals in explosive force a pound of dynamite. Like most popular sayings this does not mean anything, and is founded on nothing tangible; but at least it may remotely suggest the fearful violence of a boiler explosion. Perhaps it may also help to say that a saw-mill boiler which blew up at Kerrick, Minn., May 11, 1909, killing 5 men and wounding 4, hurled debris a distance of a quarter of a mile.

COURTESY HARTFORD STEAM BOILER INSPECTION AND INS. CO.

ONE LIFE AND $200,000 THE COST.
Disaster at Shelton, Conn.

Somebody took the trouble to calculate the mechanical energy expended in the explosion of a boiler in the shoe factory

of R. B. Grover & Company, at Brockton, Mass., March 20, 1905. The explosion blew down one four-story wooden building and partly wrecked other sections of the plant, killing 58 employes and wounding 117 out of a total of 400 in the factory, and starting a fire which spread to other buildings causing a total loss of $250,000. The boiler was 17 feet long and 6 feet in diameter and contained 140 three inch tubes. At the time of the explosion it contained about 240 cubic feet of water and 103 cubic feet of steam at 90 pounds pressure. The sudden release of this quantity of steam and water from 331 degrees in the boiler to the temperature of the atmosphere, developed mechanical energy equal to 568,643,000 foot pounds. If properly applied this would have been sufficient to lift the boiler and its contents, weighing 30,000 pounds, 18,954 feet, or 3.5 miles.

All this is merely a paper calculation. The boiler was not actually lifted three miles and a half into the air. Once, and once only, it has been possible to measure with a fair degree of accuracy the height to which a boiler was thrown by an explosion. A four hundred horse power water tube "safety" boiler, one of a battery of 17 in the power plant of the Denver, Col., Gas and Electric Company blew up June 15, 1909, killing 6 and injuring 4, and doing $60,000 damage. A part of the boiler was shot up through the roof like a rocket by the action of the steam emitted from the broken tubes. It went up to a great height and fell back through another part of the building. A man named Harley was sitting in an office on an upper floor of a building more than half a mile away. Hearing the sound of the explosion he looked out of the window in time to see the boiler as it turned at the height of its flight. He saw it just over the sash of the window which was partly raised. Over the sill he could see the ball on top of a flagstaff on another building. By measuring the distances from his chair to the window, to the ground, to the flagstaff, to the scene of the explosion and taking the angle from the eye of the observer over the sill and over the sash it was possible to work out the height of the boiler when seen. This was 1,659 feet.

But to return from the specific to the general: the only statistics compiled on the subject of boiler explosions in the United States are those gathered by the Hartford Steam Boiler Inspection Insurance Company, and it is not pretended

COURTESY HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.

THREE WERE INJURED IN THIS HEATING BOILER EXPLOSION.

COURTESY HARTFORD STEAM BOILER INSPECTION AND INS. CO.

WATER TUBE BOILER THAT WENT TO SMASH.
Four persons were injured.

that these are complete. These incomplete returns show that between October 1, 1867, and January 1, 1910, there were 10,601 boiler explosions in the United States which killed 11,111 persons and injured 16,056. The following table shows the number of explosions and the number killed and injured annually since 1886:

Year	Explosions	Killed	Injured
1886	185	254	314
1887	198	264	388
1888	246	331	505
1889	180	304	433
1890	226	244	351
1891	257	263	371
1892	269	298	442
1893	316	327	385
1894	362	331	472
1895	355	374	519
1896	346	382	529
1897	369	398	528
1898	383	324	577
1899	383	298	456
1900	373	268	520
1901	473	312	646
1902	391	304	529
1903	383	293	522
1904	391	220	394
1905	450	383	585
1906	431	235	467
1907	471	300	420
1908	470	281	531
1909	550	227	422

A comparison of the disgraceful list of disasters in the United States with the experience of England and Germany reveals a contrast amazing beyond belief. While the totals representing the loss of life and property in the United States are mounting steadily higher year by year the figures in those two nations, never large, show a decrease. In making comparisons it must be borne in mind that the returns in England and Germany are official and complete while those for this country are only such incomplete returns as could be gathered by a private corporation.

An official report of the British Board of Trade, the Marine department of which is charged with the investigation of all boiler explosions, whether in vessels or elsewhere, shows that in the twenty-five years from 1882 to 1907 there were 1,705 boiler explosions in Great Britain which killed 697 persons and injured 1,460, as compared with 7,408 explosions in the United States in

DISASTER IN A LUMBER MILL.
Two were injured in this explosion at Elizabeth City, N. C.

which 7,144 persons were killed and 10,874 were injured in the same period. In other words, we had four times as many explosions as Great Britain in which ten times as many persons were killed and seven times as many injured. This is an average of 68.2 explosions per year in Great Britain as compared with 180 to 550 a year in this country. The *greatest* number killed by boiler explosions in Great Britain in one year was 43 in 1895; the *smallest* number killed by boiler explosions in the United States in any year the same period was 244. The greatest number injured in any one year in Great Britain during the period was 85 in 1895; the smallest number injured in one year during the period in the United States was 220 in 1904.

The disgraceful record cannot be explained away by assuming that the number of boilers in use in this country was correspondingly larger than in Great Britain. While statistics on this point are not available it is certain that the difference is not enough larger to account for the difference in the number of explosions.

If a comparison with Great Britain is damaging a similar comparison with Germany is damning. Police returns show that in the thirty-one years from 1877 to 1907 inclusive there were 498 boiler explosions in Germany, or an average of 16.1 per year, in which 319 persons were killed, an average of 10.3 per year, and 613 injured, or an average of 19.8 per year. During the same period in the United States there were 8,692 explosions, or seventeen times as many as there were in Germany, in which 8,768 persons were killed, or twenty-seven times as many as in Germany, and 13,151 injured, or more than twenty-one times as many as in Germany.

Facts familiar to all who have any-

thing to do with steam explain this contrast. It is common knowledge that no other appliance used by man suffers so much from ignorant abuse as the steam boiler. Any one is considered capable of managing a boiler. Incompetence, indifference and neglect in the handling of boilers are common. In the explosion of seven boilers at St. Louis already referred to, in which seven men were killed and property valued at $50,000 was destroyed one of the feed pipes was found completely plugged up with solid scale through which not a drop of water could be forced. The other feed pipe was filled up with the exception of an opening one-eighth of an inch in diameter. The inspectors of the Hartford Steam Boiler Inspection and Insurance Company alone examined 342,136 boilers last year, of which 642 were found unfit for further use. Besides these 169,356 defects were found of which 16,385 were dangerous.

During the last session of Congress no fewer than seven bills were introduced providing of the inspection of locomotive boilers; yet in 1909 only 7.6 per cent of the total number of boiler explosions were of locomotives. It does seem as if a little inspecting might come in handy in other quarters, and that the subject thereof should be, not the boilers, but the men who have charge of them.

A judicious application of English methods might be expected to work miracles in reducing the number of boiler explosions. In America when a boiler blows up and kills a few people not a word is said; for is it not an act of Providence that could not be foreseen nor prevented?

In England Providence is not blamed for the incompetence of man. There a boiler explosion is always followed by an investigation by the Board of Trade. If that investigation happens to disclose the fact that the boiler had not been inspected or that the inspection was inadequate, or that the inspector made suggestions to the owner of the boiler that were not carried out, the person or company at fault is fined and the fact of his negligence is given full publicity. The investigations following the 77 explosions in England in 1907 resulted in fines in 22 cases ranging from $25 to $2,000. For American use the addition of prison sentences to fines might add ginger to the English plan and go the islanders one better.

Opportunity

Master of human destinies am I,
Fame, love, and fortune on my footsteps wait,
Cities and fields I walk; I penetrate
Deserts and seas remote, and passing by
Hovel, and mart, and palace, soon or late
I knock unbidden once at every gate!
If sleeping, wake; if feasting, rise before
I turn away. It is the hour of fate,
And they who follow me reach every state
Mortals desire, and conquer every foe
Save death; but those who doubt or hesitate,
Condemned to failure, penury and woe,
Seek me in vain and uselessly implore—
I answer not, and I return no more.

—John J. Ingalls.

OLD BRICK TAVERN ON THE PIKE AT CLARYSVILLE, EIGHT MILES WEST OF CUMBERLAND, MD.

BUILDING A THOUSAND-MILE BOULEVARD

By

RENÈ BACHE

A GROWING appreciation of the historical value of the old Cumberland Road has induced the states through which it passes to undertake more or less extensive repairs along the ancient thoroughfare. Pennsylvania is resurfacing her part of it, and many of the counties in Ohio and Indiana are doing what they can to mend the great highway, which in its day was by far the most important in this country.

Hopes are entertained that the Federal government may be persuaded to co-operate with the states in a scheme for the reconstruction of the famous Pike all the way from Cumberland, Maryland, to its western terminus at St. Louis. Nearly eight hundred miles in length, and following an almost perfectly straight course from Atlantic tidewater to the Mississippi River, it would furnish a magnificent pathway for automobiles.

If this shall be accomplished, with or without help from Congress, the old road will again become a busy thoroughfare. Taverns will open their hospitable doors at frequent intervals along its length, as in the ancient days, and the echoes of the hills in the passes of the

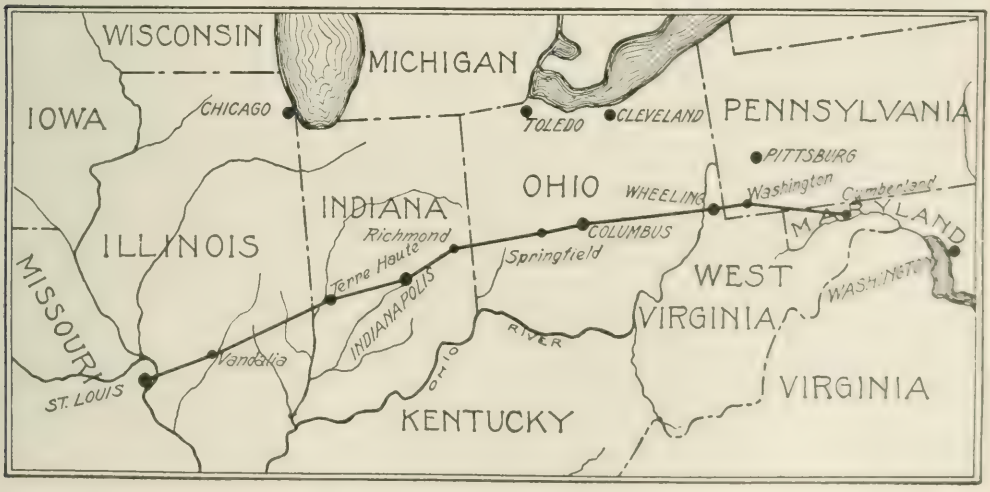
Allegheny Mountains will be awakened by the cheerful honking of motor horns—just as in former times they responded to the merry tootling of the coach guards' trumpets. It would become the fashion for automobile parties to "do the Pike," the long straight-away stretches of which would afford most attractive opportunities for speeding, while a trip over it in a gasoline car might well be deemed worth taking for the mere sake of the extraordinarily picturesque and beautiful scenery.

STATUE TO HENRY CLAY AT ELM GROVE, W. VA. This commemorates his efforts in behalf of the Cumberland Pike.

Of all the millions of people who visited the Louisiana Purchase Exposition at St. Louis, only a relative few had any notion of the fact that "The Pike," corresponding to the "Midway" at the Chicago fair, took its name from the old Cumberland Road, or Pike, as it was commonly called. In the Middle West, even at the present day, when anything novel or remarkable turns up, it is spoken of as having "come down the Pike"—this being a survival of the idea that everything odd or out of the common might be expected to arrive by way of the great national highway.

Comparatively few of the present generation realize that this was in its time the most widely known and most heavily traveled road in the United States. It was famous for the number and excellence of its taverns. On the mountain division nearly every mile had its inn—some of these places of welcome for wayfarers being sheltered behind clumps of trees, with inviting seats for passersby. The tavern signs were usually elevated on posts, while, according to an appreciative historian of those days, "the dripping of the overflow of water from the horse-troughs on the growing mint beds below lent a charm to the scene that was well nigh enchanting."

At intervals of about twelve miles along the road were "stage houses"—inns more or less pretentious, where stage horses were put up, and travelers were entertained. But these were supplemented at every mile or two by less imposing "wagon houses," depending for their patronage mainly upon the freight traffic of the great thoroughfare. Here the teamsters, transporting food products and merchandise of various kinds in huge canvas-covered vehicles, paused for refreshment—the bill for a six-horse team, put up over night,



THE PIKE THAT IS TO BECOME A BOULEVARD.
The old Cumberland Road from Maryland to Missouri

ONE OF THE BEAUTY SPOTS ALONG THE WAY.
Stone arch spanning the Castleman River, over which the road passes.

being not over $1.75, including feed for the horses, meals for the driver, and "all the drinks he saw proper to take." Those were cheaper days, when a "fippeny-bit" —six and a quarter cents—would buy two drinks of whiskey almost anywhere.

As might be imagined, there was a strange mingling of all kinds of people at the roadside taverns—"statesmen and teamsters, actors and magicians, home-seekers and adventurers," in fact, every occupation and condition of life was represented. "Circuses and minstrel troupes," says the historian, "were constantly traveling over the road, giving performances at the principal towns, and roving bands of gypsies and fortune-tellers pitched their tents and built their camp fires along the wayside. In fact, between the years 1820 and 1850, nearly everything, whether the necessaries or luxuries of life, or things intended merely to amuse, found its way into the West over the track of the old Pike."

In order to understand the significance of this great national highway, its importance, and the reason for building it, one should realize that in the early years of the nineteenth century the Allegheny Mountains formed a gigantic barrier between East and West. They were an obstacle so difficult to pass that to climb over them was an enormous undertaking. It was a common saying, indeed, that success on the further side of the Alleghenies was easy, if one could only get there; but many who wished to go were never able to arrive, and thus the settling of the West was much slower than otherwise it would have been.

Nevertheless, at the beginning of the nineteenth century it was going on pretty fast. Ohio was filling up rapidly with people, and settlers were flowing into Indiana and Illinois. There was urgent need of an artery of communication between West and East which should do away with the barrier and bring the two sections of the country into close connection for purposes of traffic. The old Cumberland Road was built not primarily as a pathway for people, but to furnish a practicable route for the transportation of freight.

The purpose of the highway was different from that of other roads which the government built. It was to bind together the East and West, and help the nation to grow—not for the special advantage of those who contributed most to it, but for that of the whole country. An historian has spoken of it as "that monument of a past age, which carried thousands of population and millions of

wealth into the West, and, more than any other national structure in the land, served to harmonize and strengthen, if not to save, the Union."

It is not true, as commonly supposed, that the project of building the road was initiated by Henry Clay. That honor belongs to Gallatin, who was Secretary of the Treasury under Jefferson and Madison. Clay, however, was the strongest advocate of the construction of the highway—in recognition of which fact, a monument to him was erected near Wheeling, West Virginia. Unfortunately, it was of a poor quality of sandstone, and is crumbling.

Like many another famous statesman, Henry Clay often traveled over the old Cumberland Road. It is related of him that, on one occasion, while journeying over the great highway in the direction of Washington, the coach on which he had taken passage was upset by a heap of limestone in the main street of Uniontown. On being picked up, luckily unhurt, he remarked: "This is mixing the Clay of Kentucky with the limestone of Pennsylvania."

Cumberland, Maryland, was selected as the starting point of the road because it was practically the head of navigation, being connected with Washington, D. C., and the tidewater of the Potomac by the Chesapeake and Ohio Canal. From Cumberland it ran to Washington, Pennsylvania, and thence to Wheeling, West Virginia, to Columbus, Ohio, to Springfield, Ohio, to Richmond, Indiana, to Indianapolis, to Terre Haute, Indiana, to Vandalia, Illinois, and finally to St. Louis.

The government having decided to undertake the building of the road, the work of construction was placed in the

ANOTHER VIEW OF THE SUPERB ARCH—EIGHTY FOOT SPAN—OVER THE CASTLEMAN RIVER.
Its parapets having fallen down have been replaced with rough board fences as a guard.

OLD TOLL HOUSE NEAR FROSTBURG, MD.

hands of the engineers of the War Department. Throughout nearly all of its length it followed a path which had been beaten smooth by the feet of Indians long before Columbus was born, and which was trodden later by the early pioneers. From Wheeling to Zanesville it pursued the course of the first road ever made through Ohio—the celebrated route marked out, by way of Lancaster and Chillicothe, to Kentucky, by Col. Ebenezer Zane, and known as Zane's Trace.

This great national highway was the longest and straightest road ever built by any government. The total cost of it, paid out of the Treasury, was about $7,000,000. It was planned to run from Cumberland to St. Louis with as few departures as possible from a straight line, but passing through the capitals of Ohio, Indiana and Illinois. As already stated, it was connected with the capital city of the nation by the Chesapeake and Ohio Canal; and it was joined with Baltimore by a road built at their own expense by the bankers of that city.

It was a very costly road. Contracts were awarded on a rather too liberal basis in some cases, and the building of the division east of the Ohio River came to about $13,000 a mile, including grading and bridges. The average expenditure in Ohio was much less than in Maryland and Pennsylvania, not exceeding $3,400 a mile. The

MAKING REPAIRS ON THE CUMBERLAND PIKE IN MARYLAND.
The highway commission in this state is gradually restoring it to first-class condition.

total width of the highway was sixty-six feet, of which thirty-two feet was graded and twenty feet macadamized.

The road was thrown open to the public in 1818, and a flood of traffic immediately began to sweep over it. United States mail coaches started running in that year between Washington and Wheeling; passenger stages began to make regular trips, and the Pike at once became the great artery of travel and commerce between East and West.

A Section of the Old Cumberland Road as It Looks Today.

It was a well-built highway. Speaking of it as it is today, Mr. Hulbert says: "Nothing is more striking than the ponderous stone bridges which carry the road over the waterways. It is doubtful if there are on this continent such monumental relics of the old stone bridge-builder's art. Not only will such massive bridges as that at Big Crossings, Pennsylvania, attract the traveler's attention, but many of the less pretentious bridges over brooks and rivulets will be found to be ponderous pieces of workmanship."

Elsewhere, the same writer says: "There is nothing like it in the United States. Leaping the Ohio at Wheeling, the National Road rolls itself across Ohio and Indiana, straight as an arrow, chopping hills in twain at a blow, traversing the lowlands at high grades like a railroad bed, and vaulting rivers and

STONE ARCH AND TAVERN AT CLARYSVILLE, MD.

THE PIKE WEST OF FROSTBURG, MD.
Showing dilapidated condition when the road was taken over not long ago for repairs by the State Highway Commission.

streams on massive bridges of unparalleled size."

As above stated, it was the rapid peopling of what is now called the Middle West that brought about the building of the road. But its construction did not proceed without halts. In 1825, the passage of an act by Congress authorizing the extension of the highway into Ohio was greeted with enormous enthusiasm; for fears had been entertained that it would not be continued beyond the Ohio River, disputes having arisen in regard to the constitutionality of the proceeding.

The Ohio is by far the broadest river crossed by the road, and for many years the passage over it, from Wheeling to Bridgeport, was accomplished by a ferry. Later on, however, the mighty stream was spanned by a bridge, which in its day was looked upon as a marvel of engineering.

The freight that passed over the old Pike was carried by broad-wheeled wagons, covered with white canvas, and drawn usually by six powerful horses. How enormous was the traffic may be judged from the fact that in the year 1822 a single commission firm in the town of Wheeling unloaded ten hundred and eighty-one wagons, and paid $90,000 in freight on their loads. Having transported westward the fabrics, hardware, and other manufactures of the East, the freighters carried back with them the products of the West—flour, whiskey, hemp, tobacco, bacon, and wool.

The bulk of the freighting was done by companies owning many wagons and regularly engaged in the business; but a considerable fraction of the traffic fell into the hands of casual wagoners, mostly farmers, who were known as "sharpshooters." The companies had arrangements for relays of horses at intervals of a few miles all along the route. An ordinary load was 6,000 pounds, but 10,000 pounds was not uncommon. Commonly the wagons carried bells; but a curious custom demanded that, if a team became stalled, and had to be helped out by another outfit, the latter should carry away the bells.

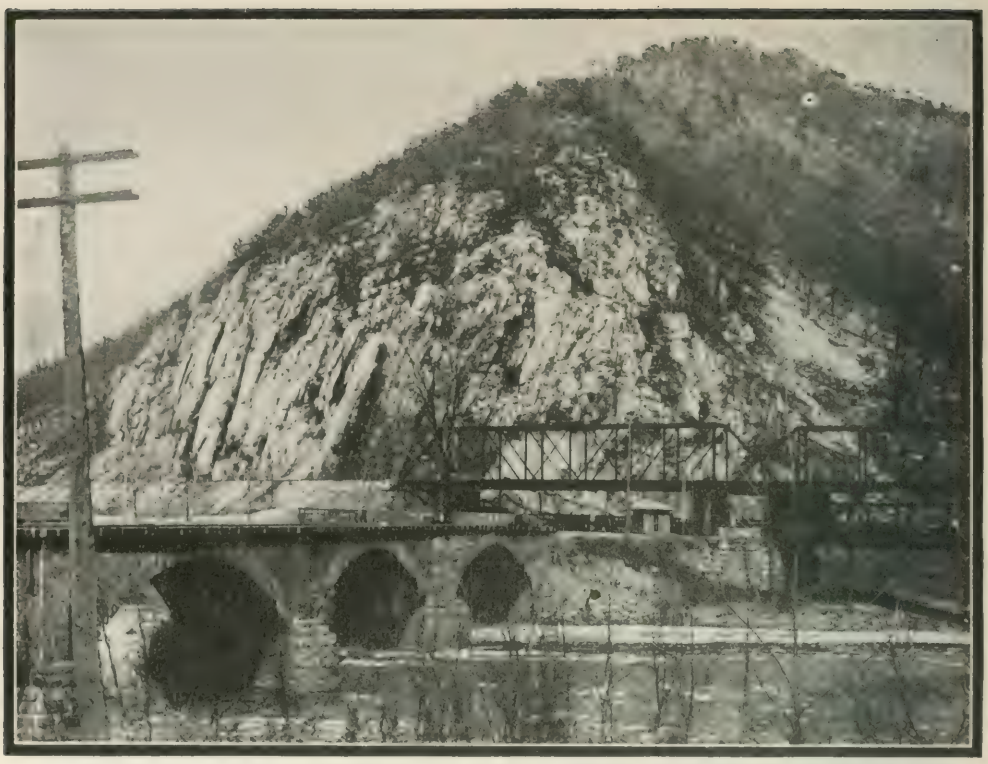
The government had contracts with the stage companies for the transportation of mails over the Pike—the most important being the Great Eastern and Great Western mails, running through between Washington and St. Louis.

THE SAME ARCH WEST OF FROSTBURG, AFTER RECENT REPAIRS.

THE OLD PIKE WHERE IT PASSES THROUGH CUMBERLAND NARROWS

With this main postal route hundreds of minor ones connected at various points along the road. Then there were certain lines of coaches which carried local mail and newspapers.

T. B. Searight, one of the road's historians, says: "The 'express mail,' as it was called, corresponded to the fast mail of today, and made astonishing time. Contracts required the Great Western mail over the National Road from Washington to reach Columbus, Ohio,



AT THE WESTERN END OF CUMBERLAND NARROWS, WHERE THE NATIONAL ROAD PASSES.

in fifty-four and a half hours, and to arrive at St. Louis in ninety-four hours! Ten miles an hour was an ordinary rate of speed."

Some of the mail coaches carried passengers, at four cents a mile, thus obtaining an additional profit. They were handsomely finished and upholstered vehicles, with three seats inside, accommodating nine persons, and an extra seat beside the driver, highly desirable in pleasant weather. Horses were changed at the relay stations almost without stopping. Undoubtedly a few of these old coaches are still in existence, and are in use today by circuses and Wild West shows—most interesting relics of a bygone epoch.

An enthusiastic writer has said: "The chariots of the Appian Way, drawn by the fastest horses of ancient Rome, were but a dismal cortège in comparison with the sprightly procession of stage coaches on this American highway."

We learn that along the line of the old Cumberland Road, in those days, might be seen as many as twenty coaches traveling in a single line. There were hotels where seventy transient guests ate breakfast in a single morning. Life along the Pike at that period was made cheerful and noisy by the echoing horns of hurrying stages, the creak and crunch of the wheels of the wagons, and the loud complaints of great herds of cattle, sheep, and pigs.

The passenger and mail coaches were operated much like the railways of today, rival companies fighting each other at times with great bitterness. In one instance a struggle between two stage coach lines brought down the charge for carrying passengers from Richmond to Cincinnati from five dollars to fifty cents. There was much rivalry in regard to speed, and a stage driver was more likely to be dismissed for slow time than for intoxication. Way bills handed to drivers often bore the words: "Make this time, or we'll find somebody who will."

The traffic over the National Road was not always unaccompanied by danger. In one case a stage coach fell over a precipice while crossing the mountains, and several of the passengers were killed. It was not an uncommon thing to be attacked by robbers—especially at night, in the passes of the wilder parts of the Alleghenies.

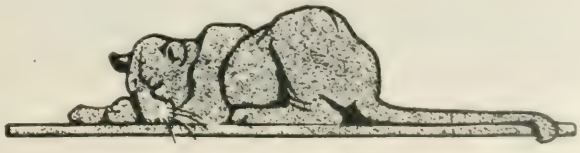
Says Hulbert: "At almost every mile of the road's long length, 'wagon-houses' offered hospitality to those engaged in freight traffic. Here a large room could be found, with its fireplace, before which to lay blankets on a winter's night. The most successful wagon-houses were situated on the outskirts of the larger towns, where, at more reasonable prices and in more congenial surroundings than in a crowded city inn, the rough, sturdy men, upon whom the whole West depended for over a generation for its merchandise, found hospitable entertainment for themselves and their horses. These houses were usually unpretentious frame buildings surrounded by commodious yards, with generous watering troughs and barns."

With all its prosperity, the road was frightfully expensive to keep up. Congress at length grew tired of appropriating money to pay for repairs, and a bill was passed establishing a toll system—the idea being that the government should collect the tolls, and use them for the maintenance of the highway. President Monroe, however, vetoed the bill, holding it to be unconstitutional, and it was thereupon decided to hand the road over to the states through which it ran, allowing them to take care of it. Maryland, Pennsylvania, Ohio, and Virginia accepted their portions during the period from 1831 to 1834, and soon toll-houses and gates were set up at intervals of fifteen or twenty miles all along the Pike.

Each animal or vehicle that passed over the road was taxed in proportion to the amount of damage it was supposed to do to the roadbed. Cattle paid twice as much as hogs, and the latter twice as much as sheep. The tariff on coaches and wagons varied inversely with the width of the tires. Vehicles with tires above six inches in width passed free, inasmuch as they served as rollers. Children and clergymen paid no toll; and in Pennsylvania persons hauling coal for home consumption were likewise "deadheads."

But the road was never self-supporting. The cost of repairing the Ohio division alone was $100,000 per annum, and the receipts from tolls did not approach this mark. Meanwhile the years passed on, and, when the middle of the century arrived, a strange sound was heard in the wilderness. It was the voice of the locomotive, and it gave notice of the doom of the good old Pike. By 1852 the steam roads had taken away the bulk of travel and freight traffic from the ancient highway, and of course the mails between East and West were lost likewise.

At the present time the old Cumberland Road is in pretty fair shape, in parts. A good deal of it is in rather bad disrepair. Quite a number of the old mile-posts are still standing. There are a few toll-houses left; likewise two or three of the old taverns, and some of the buildings formerly occupied as wagon-houses. The states, having acquired their portions of the highway from the government, handed them over to the counties and townships, so that, under different local administrations, the road has met with varying fortunes. Yet, on the whole, it is today in so decent a condition of preservation that the expenditure of a moderate amount of money would restore at least some measure of its ancient glory; and, while preserving a great historical monument, it would have the additional advantage—in itself surely worth while—of furnishing a delightful route of pleasure travel for the people.



MAKING THE FARM A FACTORY

By

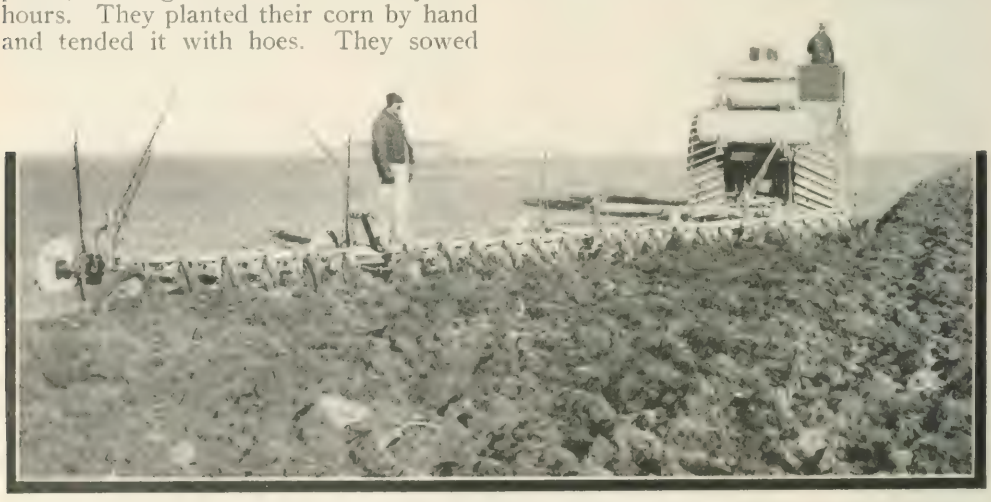
JAMES A. KING

FIFTY years ago the average farm consisted of about fifty acres and it took two men to tend it. The crops they raised would sell for about five hundred and fifty dollars. Last year in North Dakota eight men cropped two thousand acres and broke ready for crop one thousand more, doing it with the aid of traction engines. Their crop sold for forty-eight thousand dollars. Machinery made this thing possible.

The uncountable millions of wealth produced on our farms in 1909 would not have been possible under the ancient methods of fifty years ago. There were not enough farm laborers in the whole world to produce the millions of bushels of grains, the millions of tons of forage, sugar and other produce grown north of the Isthmus of Panama in 1909 if the old fashioned methods had been used.

When our fathers were youngsters they plowed with two-ox and two-horse plows, turning over an acre every ten hours. They planted their corn by hand and tended it with hoes. They sowed their grain by hand from bags hung over their shoulders. They cut it with the reaping hook and the cradle and raked and bound it by hand. They threshed it on the barn floor with a flail and winnowed it in the wind with baskets. The corn was either cut and shocked to be later shucked at shucking bees or snapped into baskets and stored in bins to be husked in the winter, the husks being carefully saved and fed to the cow.

To us young fellows who are just taking charge of the farms from which our fathers are retiring, these things they used to do when they began are but as faint unreal traditions, things to be thought of and wondered at much as we do the tales of roving bands of Indians and herds of buffalo and elk here in Iowa. Those of us who can say we have done any of these things must admit they were done as a novelty rather than as the regular routine of normal farm work. For the sake of being able



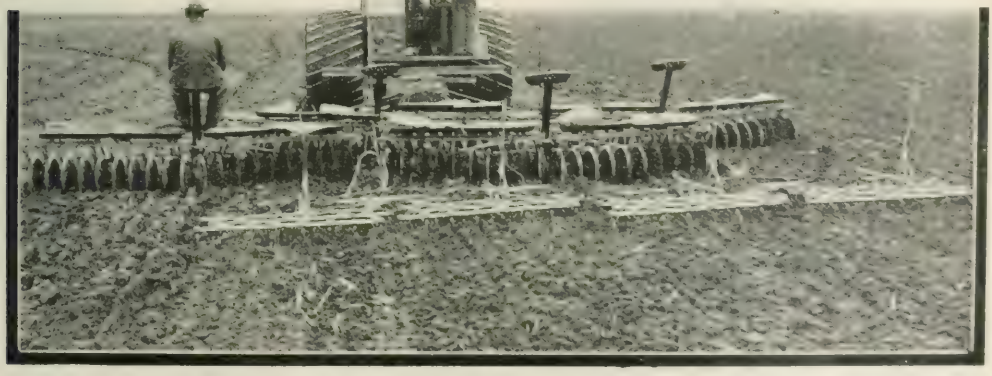
PLOWING A STRIP TWENTY-ONE FEET WIDE.
Thirty five acres were thus turned in five and one half hours on the author's farm.

to tell it, I once helped cradle, rake and bind ten acres of wheat in a stump field. I also threshed a small patch of field peas with a flail so as to learn how to swing that treacherous tool without breaking open the back of my head.

Think of two oxen yoked to a crude plow with a cast iron lay and a cast iron or wooden moldboard. They plod along slowly and awkwardly, around the field. Every time they cross the field a strip of ground ten inches wide is turned over. They plow an acre, possibly an acre and a quarter in a day. The crude plow they draw does a fairly decent job, if the ground is in good condition for plowing. In comparison with this look at an engine plowing outfit. One man drives the engine, one man watches the plows, the engine moving along sedately and unconcernedly, around and around the field. Every time it crosses the field a strip twenty-one feet wide is turned over. Such an outfit on my farm in 1903 plowed a thirty-five acre field in five hours and a half. This is better than sixty-three acres in a day. Better than sixty men and one hundred and twenty oxen would do in the old days. My father plowed with the oxen, I plow with the engine—a span of forty or fifty years.

When harvest time came the neighbors would gather into one field. A line would form with the best man in front as a pacemaker. Each would swing a cumbersome "cradle" cutting a narrow strip of grain laying it in a narrow ribbon-like line with the heads out. Behind the reapers would come the binders. With an old wooden-toothed hand rake a man would rake together enough of a strip of the cradled grain to make a bundle, lay down his rake, make a band from the grain and bind the bundle, tossing it aside and picking up his rake to gather grain for another bundle. One man could cradle about three acres and one bind about two in a day of ten hours. Behind the binders would come the shockers and among them all would move the children, carrying water to the men and gleaning the scattered heads of grain. After all the grain in the neighborhood had been cut they would stack the bundles. In the late fall and winter the grain would be threshed out on the barn floor with flails, one man threshing and cleaning eight bushels in a day. Did you ever get down on your knees and swing a flail all day long? It certainly is no fun.

In the great grain fields of this country and Canada things are done differently now. One may see a moderate sized engine hauling five or six large self-binders, each one cutting a strip eight feet wide, binding the grain into neat, uniform bundles and dropping them in bunches of five or six, handy for the shockers. Or in some sections one may see a large engine hauling a combined harvester and thresher. This machine, with five or six men to operate it, will walk right down through a field of grain and cut it, thresh it, throw the straw onto the ground and sack the grain ready for hauling to market. In this way one



DOUBLE DISCING AND HARROWING SEVENTY ACRES BETWEEN SUNRISE AND SUNDOWN.
The wagon wheel tracks appearing at left were made the same day, and give an idea of how wet the ground was.

engine and five or six men will cut and thresh from one hundred to one hundred and twenty acres of grain in ten hours. To do this same work in the old way would require thirty-five to forty men to cut the grain, fifty to sixty to bind it and if it were wheat that went twenty-five bushels to the acre it would require three hundred and seventy-five men to thresh it with flails; one engine and six men operate a machine that does the work of four hundred and fifty men of fifty years ago.

Comparisons of this nature that could be made are numberless. Measured in methods and accomplishments it is centuries. But more marked contrasts than these can be found today when comparing countries instead of generations. When soldiering in the Philippines three years ago I found the ancient methods of Palestine of two centuries and more ago in general vogue. The native farmer plows his rice fields with a crooked stick shod with a wrought iron point, made in some crude local blacksmith shop, and pulled by a plodding old water buffalo with a rope around his neck and running back between his legs to the plow. He harvests his rice with a long bladed knife or working-bolo. His buffalo treads it out in the sacred way and the process is completed by hand with large wooden pestle and mortars.

There now, and here fifty years ago, farming was done by hand. Here today it is done by machinery. Forty or fifty years ago the American farm of fifty acres was stocked with tools the total value of which would probably not exceed twenty-five dollars. On the Dakota farm mentioned above the machinery cost from nine to ten thousand dollars. On that modern farm eight men did the work of a hundred or more in the old days. The products of the labors of those hundred or more would sell for less than half as much. The farmer of then had only "tools" the farmer of now has "tools, implements and machinery."

The farmers of today is learning that he must consider carefully what it actually costs him to do his work and produce his crops. In order to make his business pay the largest net income, he must keep his cost of production at the lowest possible point he can.. If he can get his work done cheaper and better than he can do it with horses he must do it in that way. If he can feed his produce to animals which will produce him greater and quicker net returns for the food consumed he must feed it to them instead of to the horses which he no longer needs to do his work.

The farmer is facing an even greater labor crisis than is the manufacturer and the contractor. Man is a social animal. The industrial development of our country has produced great concentrations of humanity in the cities. The broader associations made possible by these have appealed to the social natures of the young men. The great industries where

PLOWING AND DISCING HEAVY WET LAND.

CRUSHING STALKS ON AND DOUBLE DISCING AND DRILLING A STRIP TEN FEET WIDE WITH A FIFTEEN HORSE-POWER ENGINE.

"things are doing" have appealed to and fired their imaginations. Thus they have been led to abandon the farm. The immigrants which come to our shores go to the cities rather than to the farms. Consequently each year we farmers face a help-famine. Last year we paid two dollars and a half a day and board for help when haying, harvesting and threshing, and could not always get as much as we wanted then and much of it was not efficient.

These conditions have existed for years and no doubt will exist for years to come. Such conditions are not relieved in one year. It is but natural that there has been and is now a great and insistent demand for ways and means to make it possible for one man to accomplish more work with no more, or even less, effort in a given time. In attempting to do this many labor-saving machines and devices have been built. In general, each machine built has been for the purpose of doing some one thing more extensively and rapidly than it could be done before. Now the tendency is towards making a single machine that will do several things at once. Plows have been made that will cut twenty and thirty feet wide. Now there is a demand for machines that will plow, disc and harrow, or disc, seed and harrow at one time. The problem of building these combinations of implements is but partially solved.

These implements and combinations of implements have considerably reduced the total number of men needed on any one farm. But the muscular power that was furnished by these men who are no longer necessary must be supplied in some way. In fact it requires more actual power to seed with machinery than by hand, for power is needed to propel the machines as well as to operate them. Consequently as the number of men needed to farm a given area has decreased there has been a corresponding increase in the number of horses needed.

In the development of these man-saving machines a point has been reached where the horses needed to operate them are so many that it is difficult for one man to handle them and attend to the machine. This, coupled with the unreliability of the horse in the rush season, has led to the development of mechanical power to pull them. This opens up a field for the engine.

Engines were already being used for operating threshing machines and some adventurous spirits tried to use them in the field to replace the horse. But engines had not yet been built primarily for general hauling work. Consequently the results were not entirely satisfactory. But there were men who saw the possibilities open to the engine that was properly constructed for this kind of work and so they developed engines that are very successful for all kinds of general farm work.

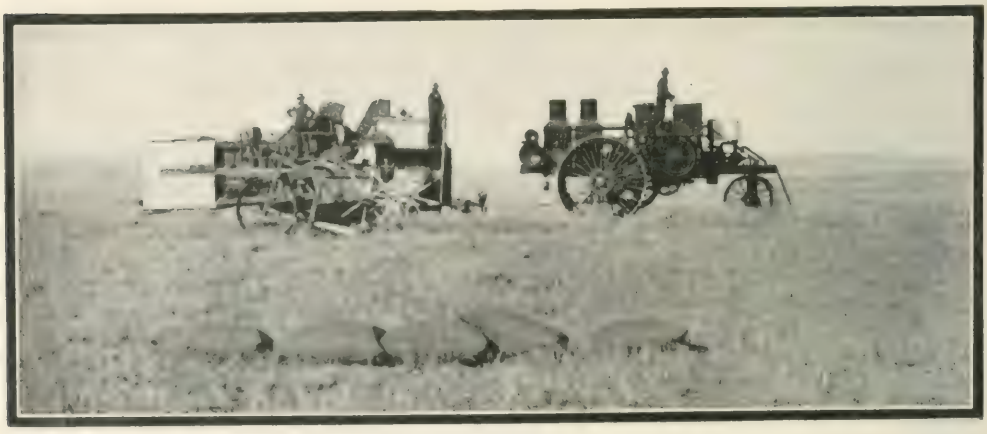
These are now rapidly displacing the horse for many things. Seeing that they were a success for the things at which they had been tried in the small-grain belt I determined to try them for gen-

FILLING A TILE DITCH.
These two men covered twenty-five miles in this fashion.

eral farm purposes on an Iowa farm. I did so and found them very satisfactory. Each year I expect to do more and more with them than I have in the past, for each succeeding year's work shows up new possibilities. And since they are proving a success when hauling implements that were built to be hauled with horses, hitching several of them to one engine, they will prove more successful when operating implements that have been built primarily for use with engines.

Last year, on a farm of seven hundred and sixty acres, I kept regularly three work horses, hiring extra horses when haying and threshing. This year, with a thousand acres to farm I expect to keep only four horses all year and expect to need fewer extra horses during the rush season, using the engine more at this work than before.

This reduction in the number of men and horses required on the farm is not the only valuable feature in an engine. In almost the entire United States and all over Canada there are certain months of the year when little or no work is done in the fields. The horses stand idle in the barn, eating regularly three times a day. The only return their owner gets from the feed they eat is the manure they make. In fact the horse nowhere near pays for his keep during these months. The same feed given to cattle, sheep or hogs would give just as great value in manure and would also give an income in the form of milk, wool and flesh. The engine has consumed



CUTTING AND THRESHING WHEAT—125 ACRES IN A DAY.

nothing and so costs nothing, during these months.

The heaviest, hardest and most important work of the year comes in the spring, immediately following a spell of idleness. The horses have not been doing enough to keep them in good working condition. They cannot be rushed much when the weather permits one to work. The engine is in just as good condition at the end of the idle spell as it was at the beginning. And here is where I get one of the greatest benefits from my engine. When the seeding season does finally get good I divide my men into two shifts and we work the engine day and night. We get our small grain all in within a few days when the conditions are the best and my chances are that much better for a uniformly good crop. It looks mighty good to me to see that old engine pounding away from seven in the morning until six at night and then from seven at night until six in the morning when every minute saved means dollars in the pocket.

My engine in the field will do the work of twenty-two to twenty-six average farm horses and the original cost for it is much less than for them. When used double shifts it will do the work of forty-five to fifty horses. My fuel and oil for a ten hour run costs less than the feed for twenty horses for a day. My engine repairs cost less than the shoes, doctor bills and harness repairs for these twenty horses.

The engine will do better field work than will the horses. When plowing with an engine one can also disc and harrow at the same time. Discing and harrowing done immediately behind the plow is far better and costs less than when done after the ground dries out. With the engine I can disc the ground, drill in the grain and harrow it all at one time. This insures quicker and more uniform germination of the seed than does the old method. In this way any ground gone over once is all completed and a heavy rain storm or a wet spell does not make it necessary to do the work all over again.

It costs me less to do these various field operations with an engine than it does with horses. When plowing over two hundred acres eight inches deep, two men with a twenty-two horse engine averaged two and four-tenths acres an hour. The total cost an acre for fuel, lubricating oil, labor and repairs was thirty-eight and a fraction cents when I was paying one man two dollars and seventy cents and the other a dollar and fifty cents a day. One man with that same engine double-disced and harrowed at an average cost for the above items of twenty-four and a fraction cents an acre. Farmers in my immediate vicinity were offering a dollar and a quarter an acre for plowing and had I had the time I could have contracted over two thousand acres at that price in the fall of 1909. According to experiments conducted by the United States Department of Agriculture it costs from twenty-five to thirty-five cents an acre to single disc ground with horses and yet I double disced and harrowed at a cost of twenty-four and a fraction. I did several of these things separately last year so as to find out absolutely whether it were costing more to do these things with an engine than with horses. I proved that it cost considerably less.

There are some things a man who owns an engine should plan to do in order to get the greatest possible returns from his investments. He should use it for as many different things as he can, use it as many days in the year and as many hours in the day as possible and keep the operating expenses at the lowest possible point.

I not only try to do as many different things with my engine in a year as I can but I also try to do as many at one time as can be done advantageously. For instance, when plowing ground to be cropped that same year, or season, it should be disced and harrowed at the same time. These same two men required to operate the plow will do all three of these things by simply reducing the number of plows hauled and fastening the discs and harrows on behind the plows. Last year my engine was in constant use from April until in December. During that time I used it for plowing, discing, seeding, harrowing, harvesting, hauling the hay and bundle wagons when stacking, building roads, dragging roads, digging open ditches, filling tile ditches,

PUTTING ON TWO TONS IN TWELVE MINUTES.
The hay rack is nine by twenty feet; the tractor travels five miles an hour.

and, in addition, doing heavy hauling and threshing.

The day of the traction engine has but begun. The machine or power farm is with us. In the future we shall "traction" the soil and the horse will become more of a friend and companion and less of a slave. The young man who delights in handling machines and engines will find his delights at home on the farm and not in the dark, dirty, crowded city. On the machine farm he will find the opportunity to do the great things of which he dreams and his labor problems will have been solved. He will become an important factor in the great task of feeding the world.

With a large roomy house, the farmer of the future can have all the modern conveniences of the city home with the blessing of pure air, room and space, delightful scenery and privacy without seclusion, which are known to the city dweller only on rare holidays. He will have modern heating and plumbing systems. If he does not care to make his gas engine do double shifts in the fields he can hitch it in the evening to a private dynamo and it will light his home and barns and while he sleeps will charge a storage battery with which to operate feed grinders, pumps, washing machines and other things during the day. With the traction engine, the automobile, modern home equipment with sewers and electricity, the telephone and the daily mail at his disposal the farmer will be the aristocrat of the future.

Soliloquy From Macbeth

Tomorrow, and tomorrow, and tomorrow,
Creeps in this petty pace from day to day
To the last syllable of recorded time,
And all our yesterdays have lighted fools
The way to dusty death. Out, out, brief candle!
Life's but a walking shadow, a poor player
That struts and frets his hour upon the stage
And then is heard no more; it is a tale
Told by an idiot, full of sound and fury,
Signifying nothing.

—SHAKESPEARE.

CAMPAIGN AT PUBLIC EXPENSE

By

WORTH C. HARDER

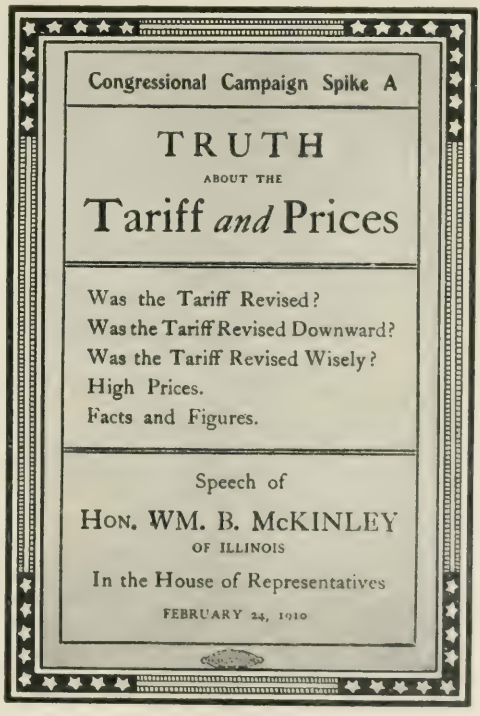
SENATOR BENJAMIN R. TILLMAN of South Carolina had a typewriter. The government had purchased it for his official use, and he was in the habit of taking it to his home in South Carolina during the recess of congress, to aid him in getting out his official correspondence.

Senator Tillman's typewriter reached Washington on the last return trip January 5, 1909. It came into the central postoffice with one of those mysterious things, a congressional frank, attached to it. In other words, Senator Tillman's name was written across a piece of paper, which was expected to pass current for any quantity of postage stamps that might otherwise have been required.

Now, the congressional frank is anything but a mysterious instrument when properly viewed. It was given by a lenient public to its legislative servants for certain specified purposes: To send parts of the Congressional Record, speeches and public documents to those persons who want them; to send government seeds out in small quantities to a member's constituents; and for the conduct of official correspondence, when such official letters do not weigh more than two ounces.

Senator Tillman's typewriter paused in the Washington postoffice. It was viewed by various under-officials of the service, and finally by the postmaster of Washington himself. It was plain that it was a typewriter. That was the trouble with it. It would not pass as "part of the Congressional Record," nor as a public document, a package of seeds, or official correspondence weighing less than two ounces. So Senator Tillman was notified that the postoffice had one typewriter, directed to him, and held for the payment of postage charges. Said typewriter was not properly entitled to the franking privilege.

Instantly there was one of those storms that occur at intervals about the capitol, and that threaten to wipe the entire postoffice department out of existence. Step on a senator's or a congressman's franking privilege, or hint that it is being wrongly used, and you bring forth a united protest from


Congressional Campaign Spike A

TRUTH

ABOUT THE

Tariff *and* Prices

Was the Tariff Revised?
Was the Tariff Revised Downward?
Was the Tariff Revised Wisely?
High Prices.
Facts and Figures.

Speech of

HON. WM. B. McKINLEY

OF ILLINOIS

In the House of Representatives

FEBRUARY 24, 1910

"TARIFF SPIKE A."

Three million copies of this, the principal document of the Republican committee, were printed. This was held up by the postoffice department when first mailed, but was found to be entirely in accordance with the franking law.

WEIGHING THE DEMOCRATIC CAMPAIGN BOOK.
At first this was held up to determine whether frankable. Investigation showed it must be accepted postage free. At right, "Story of a Tariff."

his associates who believe that some doubt is cast upon the integrity of the entire legislative assemblage. Senator Tillman declared that he would not pay postal charges on the typewriter. It was government property, he said, and the government should pay for its necessary transportation.

But the senator from South Carolina had the wrong end of the free-mailing controversy. He was attempting to send something under a frank, that the law did not provide for. Such an attempt, however innocently made, at once constitutes an "abuse" of the franking privilege, and Congress feels that it has suffered too much under the outrageous charges that its members have abused the privileges of free postage.

Why, there was a member of the house in earlier days, known for years amongst his associates as "Boots," because a franked package which he sent through the mails broke open and disclosed a pair of his boots which he was franking home. The stories of the member who sent his laundry regularly through the mail between the capitol and his home town; of the Illinois senator who franked his entire law library home; and of the mythical members who sent all sorts of barnyard animals and furniture through the mails, arise at frequent intervals to plague the representatives and senators who are so jealously guarding the sanctity of the free-mailing privilege.

Three Tons of Campaign Mail for Free Transmission.

But, to quote the words of Senator William J. Stone of Missouri, delivered in the senate May 8, 1910: "It is all right if it is done in accordance with law."

Let us see how the franking privilege works for the

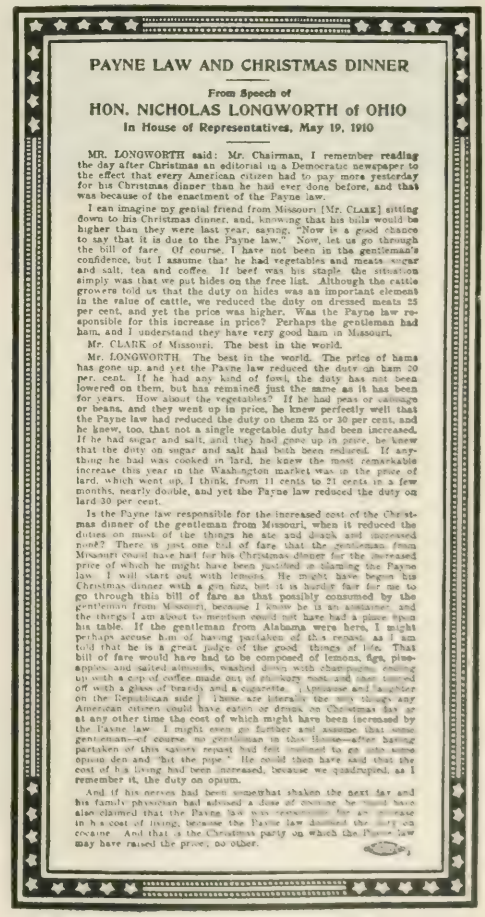
campaign committee. Have you received during the last two or three months any such things as a red-covered "Story of a Tariff"; or a "Democratic Campaign Book for 1910"; or "Benefits of the Payne Tariff Law, by Nicholas Longworth"; or "Speech of Joseph G. Cannon, Delivered at Kansas City"; or "Tariff Speech; Address of President Taft at Winona?" Has such a document come in a large manila envelope, with "Part of Congressional Record—Free" printed in the upper left-hand corner, and some congressman's or senator's name in facsimile signature at the upper right-hand corner?

If so, you may figure that the United States postal service, which ultimately means the patriotic public which helps to make up the postal deficit, has spent over five and one-half cents in cold, hard cash to bring that campaign document to you. It means that you, and not the campaign committee nor the individual congressman, are "paying the freight."

During the month of August, and for many weeks previous, wagons were hauling from eight to twelve tons of campaign material to the Washington postoffice every day for free transportation through the mails. Other tons were being dumped into the mails at Philadelphia, where both parties have much of their campaign "thunder" printed. In Chicago, New York and scores of other cities throughout the United States, committees and individual congressmen have been remailing thousands of pounds of the stuff, again without the payment of postage, for delivery to individual voters.

Technically this does not constitute any abuse of the free-mailing privilege given by the public to members of congress. Actually, however, it is the greatest abuse of the free-mailing system that remains in the United States. It is done entirely in accordance with the law, but it is a stretching of the law which will cost the country considerably over a half million dollars this year in direct loss in the postoffice revenues, and a direct charge upon the postoffice department.

When the mails were weighed in 1907, which was not a campaign year, it was found that the congressional frank had cost the postal service over $518,000 for that single year, and that the government had lost five and seven-tenths cents on every single piece of franked matter transported during the year. This was entirely aside from the $5,000,000 which it cost to transport the free "official" mail of the government's executive departments. This year there has been an orgy in the postal system that the country must pay for at a high rate. Both political campaign parties, intent upon the greatest fight of recent years for the control of Congress, have conducted a "campaign of education" such as has seldom before been attempted in the country. The Republican campaign managers asserted before August 1 that they had sent out more "literature" up to that time than during any entire cam-



PAYNE LAW AND CHRISTMAS DINNER

From Speech of

HON. NICHOLAS LONGWORTH of OHIO

In House of Representatives, May 19, 1910

MR. LONGWORTH said: Mr. Chairman, I remember reading the day after Christmas an editorial in a Democratic newspaper to the effect that every American citizen had to pay more yesterday for his Christmas dinner than he had ever done before, and that was because of the enactment of the Payne law.

I can imagine my genial friend from Missouri [Mr. CLARK] sitting down to his Christmas dinner, and, knowing that his bills would be higher than they were last year, saying, "Now is a good chance to say that it is due to the Payne law." Now, let us go through the bill of fare. Of course, I have not been in the gentleman's confidence, but I assume that he had vegetables and meats, sugar and salt, tea and coffee. If beef was his staple the situation simply was that we put hides on the free list. Although the cattle growers told us that the duty on hides was an important element in the value of cattle, we reduced the duty on dressed meats 25 per cent, and yet the price was higher. Was the Payne law responsible for this increase in price? Perhaps the gentleman had ham, and I understand they have very good ham in Missouri.

Mr. CLARK of Missouri. The best in the world.

Mr. LONGWORTH. The best in the world. The price of hams has gone up, and yet the Payne law reduced the duty on ham 20 per cent. If he had any kind of fowl, the duty has not been lowered on them, but has remained just the same as it has been for years. How about the vegetables? If he had peas or cabbage or beans, and they went up in price, he knew perfectly well that the Payne law had reduced the duty on them 25 or 30 per cent, and he knew, too, that not a single vegetable duty had been increased. If he had sugar and salt, and they had gone up in price, he knew that the duty on sugar and salt had both been reduced. If anything he had was cooked in lard, he knew the most remarkable increase this year in the Washington market was in the price of lard, which went up, I think, from 11 cents to 21 cents in a few months, nearly double, and yet the Payne law reduced the duty on lard 30 per cent.

Is the Payne law responsible for the increased cost of the Christmas dinner of the gentleman from Missouri, when it reduced the duties on most of the things he ate and drank and increased none? There is just one bill of fare that the gentleman from Missouri could have had for his Christmas dinner for the increased price of which he might have been justified in blaming the Payne law. I will start out with lemons. He might have begun his Christmas dinner with a gin fizz, but it is hardly fair for me to go through this bill of fare as that possibly consumed by the gentleman from Missouri, because I know he is an abstainer, and the things I am about to mention would not have had a place upon his table. If the gentleman from Alabama were here, I might perhaps accuse him of having partaken of this repast, as I am told that he is a great judge of the good things of life. That bill of fare would have had to be composed of lemons, figs, pineapples, and salted almonds, washed down with champagne, ending up with a cup of coffee made out of shrubbery root, and then topped off with a glass of brandy and a cigarette. [Applause and laughter on the Republican side.] Those are literally the only things any American citizen could have eaten or drunk on Christmas day or at any other time the cost of which might have been increased by the Payne law. I might even go further and assume that some gentleman—of course no gentleman in this House—after having partaken of this savory repast had felt inclined to go into some opium den and "hit the pipe." He could then have said that the cost of his living had been increased, because we quadrupled, as I remember it, the duty on opium.

And if his nerves had been somewhat shaken the next day and his family physician had advised a dose of cocaine, he could have also claimed that the Payne law was responsible for an increase in his cost of living, because the Payne law doubled the duty on cocaine. And that is the Christmas party on which the Payne law may have raised the price; no other.

CAMPAIGN MATTER FRANKED AT THE NATION'S EXPENSE

CONGRESSMAN JAS. T. LLOYD OF MISSOURI.
Chairman of the Democratic Congressional Committee, which also floods the country with franked campaign documents.

paign of former years. Hundreds of tons of speeches delivered in Congress have been poured into the overloaded mails for transportation without postage.

During the Christmas recess of Congress in 1905 the Washington Post printed an editorial liberally "embroidered," as was afterwards explained, with statements that congressmen "frank a cow, a washtub or a churn as glibly as they do a letter or a speech that no one ever heard of." The luckless author of the editorials to which they took exception, and the proprietor of that paper in which it appeared, were summoned to testify before a congressional committee as to what they knew of these alleged abuses. The cow was found to have belonged to an Illinois governor and to have been sent by express. The loaning of congressional franks to committees and associations was found to be a real abuse.

When the inquiry was over the committee reported that no specific instances of the abuse of the franking privilege had been found. That was on March 15, 1906. A little over three months later the annual postoffice bill was passed and was signed by the President June 26. It contained this highly important provision, to which apparently no one took exception:

"That hereafter it shall be unlawful for any person entitled under the law to the use of a frank, to lend said frank, or permit its use by any committee, organization or association or permit its use by any person for the benefit or use of any committee, organization or association.

"Provided, That this provision shall not apply to any committee composed of members of Congress."

So while it is an abuse of the franking system to send a government typewriter, it has been made entirely legal for the campaign managers of the two parties to fix upon the country an enormous charge for the free carriage of campaign thunder selected entirely by the campaign managers, often not approved of by the people, and to the posting of which the people have no opportunity to object.

The elastic rules of Congress permit almost anything that "looks good" to the campaign managers to be brought within the purview of the free-mailing authority. For instance, President Taft went to Winona, Minnesota, early last September, and delivered a speech in defense of the new tariff law which was instantly seized upon as the "key-note" of the present congressional campaign.

It was an excellent speech, but of course it would cost the Republican managers lots of money to send it to every wavering voter. Consequently on the seventh day of December, one day after Congress convened for the winter, Senator Carter, of Montana, arose, offered the speech, had it printed in full in the Congressional Record, and asked that authority be given to have it printed as a document. That was enough to entitle it to the full privileges of the congressional frank, and hundreds of thousands of copies have been poured through the mail in the last few months.

Senator Carter must have forgotten

this little campaign act of his last May, when the abuse of the franking privilege made its annual appearance as a subject of debate in the senate. Discussing the way the spirit of the free-mailing privilege had been abused in the past, he said:

"Undoubtedly books have heretofore been presented, incorporated in the Record, and sent broadcast over the country, under frank. I have always felt that while that was permissible it was neither with good taste nor in conformity with good practice. The printing in the Record of a speech delivered on the outside is certainly an invasion of the privilege of the Record, and of the franking privilege, in spirit, if not in letter."

Senator Hale, of Maine, introduced during the last session a newspaper report of Speaker Cannon's speech before the Knife and Fork club of Kansas City, and a report of President Taft's Lincoln Day speech at the Waldorf-Astoria in New York. All of these outside speeches have been printed and circulated by the hundreds of thousands of copies.

Early in the year a red-covered book, composed almost entirely of extracts from speeches made in congress, appeared in the mails, bearing on its cover the words, "Story of a Tariff." The book comprised four hundred and seventy-eight pages, weighed fourteen ounces, and was first encountered under the personal frank of Senator Gallinger of New Hampshire.

It turned out that the book was printed and circulated by the American Protective Tariff League of New York; that the speeches it contained had been selected by that organization and in many cases cut down so that their true meaning was lost. The book, as an ordinary article of the mails, would have paid seven cents into the postoffice treasury for each copy. Senator Gallinger said he had given authority for the use of his frank in sending it out, believing it to be composed entirely of extracts from the Congressional Record.

Senator Stone brought the book to the attention of the senate. He said he simply wanted to know whether such things could be done. Senator La Follette called attention also to the fact that

CONGRESSMAN WM. B. MCKINLEY OF ILLINOIS.
Whose speech in defense of the tariff, franked everywhere, the long-suffering public was obliged to pay for.

the American Protective Tariff League was sending out a circular letter, likewise, without paying postage; and Senator Bacon urged that the investigation be made a general one.

But Senator Stone's remarks were particularly lucid.

"Mr. President," he said, " . . . if documents of this kind can be compiled, prepared and circulated for political effect by one party or by any organization with a view to influencing public judgment and promoting party interests, I should like to know it, to the end that the representative bodies of other political parties may avail themselves of the same privilege."

An investigation was ordered, and an immediate report was promised. This report was delayed from time to time, and Congress finally adjourned without its having been made. It will be submitted in December, but the campaign will be safely over then. The events that

followed Senator Stone's speech are interesting, however.

His particular objection to the "Story of a Tariff" was not that it was sent out by the American Protective Tariff League, but that it contained certain things not found in the Congressional Record, and was therefore not properly frankable. For instance, there was the title; there was a page of introductory sub-heads, and sub-heads throughout the volume. There were quotations not in the Record. Trivial matters these, but Senator Stone insisted they were not in the Congressional Record.

"If the Democratic congressional committee, for example, should prepare a document along these lines," he said, "I would not care to have it held up and the committee brought to task by the postal authorities."

In the succeeding weeks the Democratic committee did prepare a document along very similar lines, to serve as the campaign "text-book" for 1910. But Senator Stone's remarks had furnished the cue to Congressman James T. Lloyd of Missouri, chairman of the Democratic campaign committee. On June 16 Mr. Lloyd secured the privilege of the floor of the house and delivered an unusual but important speech, extracts of which are enough to show its import:

"Mr. Speaker: It is the purpose of the Democratic congressional committee to publish a campaign book, the title page of which will have these words: 'Democratic Campaign Book for 1910, Published by the National Democratic Congressional Committee.'

"It is our purpose also to give the names of the members of the committee, its officers and sub-committee."

Then Mr. Lloyd gives the names. Likewise he gives the sub-headings, the short prefatory statement and introduction. Through the simple expedient of reciting to the house what the campaign book would contain, aside from the parts already in the record, the entire book, weighing fourteen ounces, became entitled to free transmission through the mails. Thousands of copies have been printed and mailed, with no postage expense to the Democratic committee or Democratic congressmen.

There is another branch of the free mailing system where great abuses have existed, but where every effort has been made in recent years to bring about economies. This is the "government mail" service, or "penalty envelope" system used by all the executive departments of the government for the transaction of official business. The majority of the departments also have patronized the registered mail service as though it were a free lunch stand. Postmaster General Hitchcock, however, has forced a reduction in the amount of free government registered mail by twenty-five per cent.

Pile of Franked Campaign Matter on the Receiving Platform at Washington.

The "penalty envelope" carries with it a penalty of $300 for its misuse, while the congressional frank has no penalty attached to it. But some years ago an army post in the West had a billiard table that the war department decided should be sent to another post in an exchange of furniture

and equipment. To send the table by express or freight would have eaten into the annual appropriation given by Congress to the War Department for maintenance. So, a "penalty envelope" was tied to its leg, it was bundled into a United States mail car, and was hauled to destination, the railroads receiving pay for it as though it had been regular mail matter. But the charges went against the postoffice deficit, not against the War Department.

The Treasury Department has sent 1,000 pound steel safes, office furniture, filing cases, lounges, chairs and other freight; and the Postoffice Department has bundled into the mail cars, with "penalty envelopes" tied to them, cancelling machines, pieces of furniture, carpets, typewriters and numerous other articles. Even a horse, "although a stuffed one," was shipped through the mails at the time of the Chicago exposition. It was part of a government exhibit, and went through as registered mail, insuring its safe transportation and again—the important part—the charge went where all the charges of the free mail service go—against the general income of the Postoffice Department, and to help swell the deficit that last year amounted to $17,000,000.

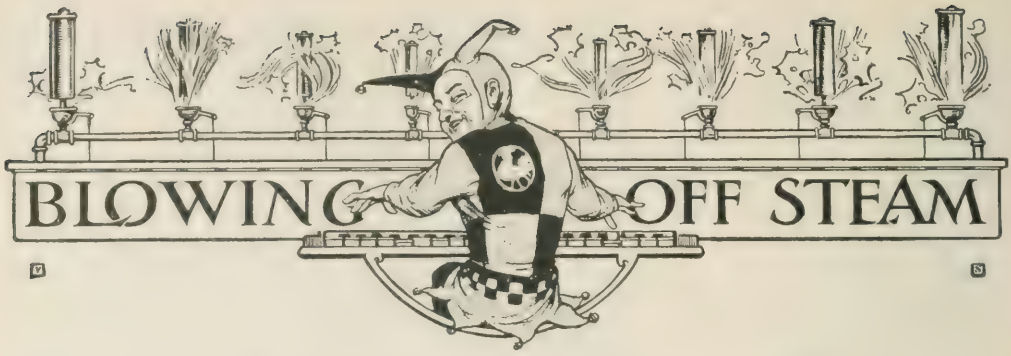
THE GOVERNMENT PRINTING OFFICE, WHICH HAS TURNED OUT MILLIONS OF COPIES OF SPEECHES TO BE MAILED BROADCAST AT THE PEOPLE'S EXPENSE.

In most cases of recent years, to do justice to members of both houses, the congressmen themselves have not been found guilty of wilfully violating the franking privilege, at least in spirit. It is true that the long cedar boxes that go out of Washington by the scores at the close of a session, and come back just at the opening day, contain many things that, if exposed to the light of day, would never pass scrutiny of the postoffice officials as "Part of the Congressional Record." These boxes, about two and a half feet long, iron-bound, and with hinged and padlocked covers, are the receptacles into which the members dump all the office equipment that they think necessary to transfer from Washington to their homes for the recess of Congress. Into it go stationery, supplies, small office devices, and in some instances typewriters. The trouble with Senator Tillman's typewriter was that it could be identified as such. Below the padlocks of these congressional boxes the postal authorities do not go.

As a courtesy to in-coming, and departing congressmen, the congressional frank is accorded to members-elect, and to departing members for a period of nine months after the expiration of their terms. This has often produced embarrassing circumstances for Congress to deal with.

One Western congressman who was defeated for office, spent the nine months after his retirement in conducting an "official" campaign for re-election from Washington, sending free seeds, offering to conduct official business, and writing "official" letters to practically every voter in his former district.

It is the consensus of opinion amongst recent heads of the nation's Postoffice Department that the "free-mailing" privilege must be abolished. In no other way can economy in postal matters be established in the government departments, or justice be secured for the private patron of the postoffice who has no desire to help pay campaign bills.



His Fervent Wish

Mrs. Ponderosa—"I would like to see a nightgown that would fit me."

Salesman—"So would I."—*Brooklyn Life.*

How to Spend a Honeymoon

"The honeymoon is being spent on the South Coast, the bride wearing a green costume with a black hat."—*The Herald, Wimbledon.*

We know of few pleasanter distractions for the early days of married life.—*Punch.*

Consolation

Lucy—"Yes, Clarence, I really believe that, after all, we may be some day happily married—of course, not to one another."

Cruelty to Animals

Hazel, aged 7, while feeding the cat at the dinner table, was reproved by her father, who told her that the cat must wait until later, whereupon the small girl wept and said:

"I think it is a shame, just because she is a poor dumb animal, to treat her just like a hired girl."—*Pittsburg Index.*

Fee Simple

Mrs. Young—"I want to get a divorce from my husband."

Lawyer—"What are your charges?"

Mrs. Young—"My charges? Mercy! I thought I'd have to pay you."—*Boston Transcript.*

Humiliating

"And so, Miss Alma, you reject me! Well, to humble your pride a little, I'll tell you that you are by no means the first."—*Fliegende Blaetter.*

Lese Majeste

It was when the President was merely Mr. Secretary and was visiting Japan on his famous trip through the Far East. Mr. Taft was caught fast asleep in a hammock by a moving picture man, and this interesting film was being shown at a county fair in my home state, Illinois. The motion picture was being reeled off to the great amusement of the rural spectators, when a huge flaw-line suddenly darted across the film, and the screen went dark.

"Land o' mercy, Hiram," gasped a lady in the rear of the hall. "What was that?"

"Hush up, Mirandy," said the husband. "I reckon that's where the hammock busted."

Perspicacity

"Now, tell me," said the inspector, "who was the mother of our great Scottish hero, Robert Bruce?"

He pointed to the top boy, then around the class. There was no answer. Then at last the heart of the teacher of that class leaped with joy. The boy who was standing at the very foot had held up his hand.

"Well, my boy," said the inspector, encouragingly, "who was she?"

"Please, sir, Mrs. Bruce."

The Lord's Carelessness

When Mrs. Langtry was at the summit of her beauty and her fame—when crowds followed her in Bond Street and the Row—she met, at a semi-royal dinner, an African king. Mrs. Langtry, dazzling in her beauty, sat beside this king. She was in good spirits, and she did her very best to amuse and please him.

And she must have succeeded, for at the dinner's close he heaved a deep sigh and said to her: "Ah, madam, if heaven had only made you black and fat you would be irresistible!"

No Risk

"SUSANNAH," asked the preacher, when it came her turn to answer the usual question in such cases, "do you take this man to be your wedded husband, for better or for worse——"

"Jes' as he is, pahson," she interrupted, "jes' as he is. Ef he gits any bettah Ah'll know de good Lawd's gwine to take 'im; an' ef he gets any wusser, w'y, Ah'll tend to 'im myself."—*Youth's Companion.*

Love and the Laundry

"THE only thing I find to say against you is that your washing bill is far too extravagant. Last week you had six blouses in the wash. Why, Jane, my own daughter never sends more than two!"

"Ah, that may be, mum," replied Jane, "but I 'ave to! Your daughter's sweetheart is a bank clerk, while my young man is a chimney-sweep. It makes a difference, mum."—*Tit-Bits.*

A Highland Scot?

TRAMP (to lonely spinster)—"Come, Missus, arst yer 'usband if 'e ain't got a old pair o' trousers to give away."

SPINSTER (anxious not to expose her solitude)—"Sorry, my good man, he—er—er—never wears such things."

The Reason

SHE—"Why do so many men go to the bad?"

HE—"In their eagerness to be known as good fellows."—*Philadelphia Record.*

How Obtuse!

HE was very bashful and she tried to make it easy for him. They were driving along the seashore and she became silent for a time. "What's the matter?" he asked.

"O! I feel blue," she replied, "nobody loves me and my hands are cold."

"You should not say that," was his word of consolation, "for God loves you, and your mother loves you, and you can sit on your hands."

Entitled to Some Credit

"IT was Satan," said a mother to one of her children, "who put it into your head to pull Elsie's hair."

"Perhaps it was," replied the hopeful, "but kicking her shins was my own idea."

His Fears Allayed

NERVOUS PASSENGER (during fog)—"But surely you're not leaving the bridge, are you, Officer?"

OFFICER (who has just been relieved)—"Oh, yes. It's no good stopping up there; you can't see anything."—*Punch.*

Not Responsible

NURSE—"What's that dirty mark on your leg, Master Frank?"

FRANK—"Harold kicked me."

NURSE—"Well, go at once and wash it off."

FRANK—"Why? It wasn't me what did it!"

An Anachronism

WHEN some celebrated pictures of Adam and Eve were seen on exhibition, Mr. McNab was taken to see them. "I think no great things of the painter," said the gardener; "why, man! tempting Adam wi' a pippin of a variety that wasna known until about twenty years ago!"—*Argonaut.*

What the Label Said

PAINTINGS were not her specialty, but as she gazed at a beautiful copy of Millet's "Gleaners," her admiration of the work called forth enthusiastic comment. "What a wonderful picture!" she exclaimed. "And how natural it looks!"

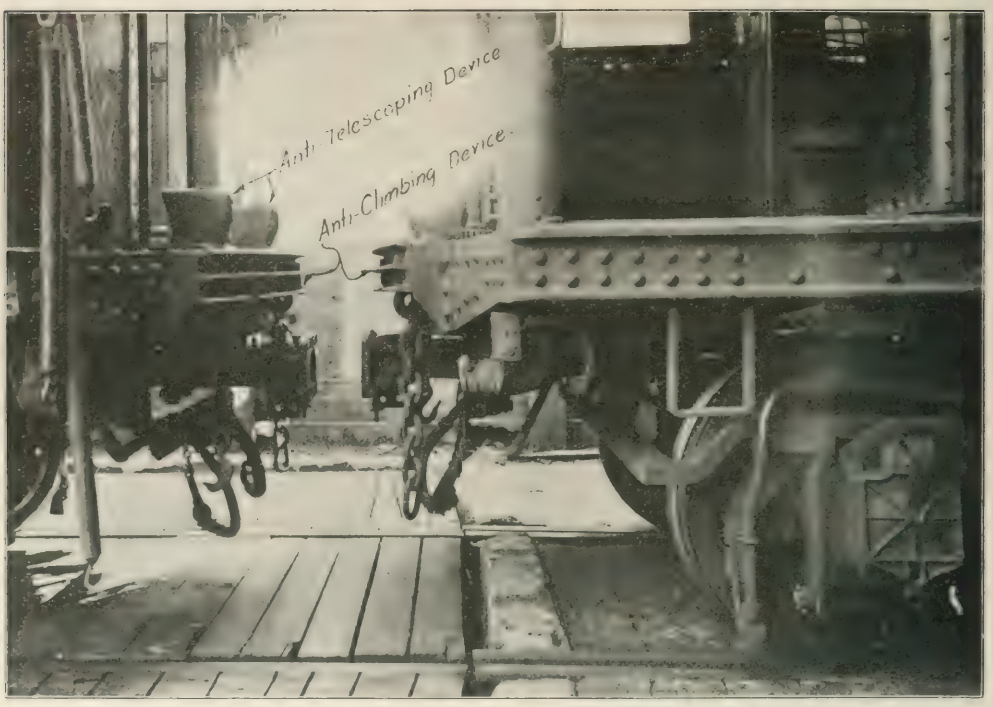
"But what are those people doing?" she inquired, as she bent nearer to read the title. "Oh, yes, I see, gleaning millet! How perfectly fascinating!"—*Youth's Companion.*

Janitoresque

JANITOR—"Who was dat whistlin' down de tube?"

HELPER—"Woman on de third floor front wants some steam."

JANITOR—"Hit de third pipe a couple o' times wit de hammer."—*Judge.*



TWO IMPROVEMENTS TO RAILWAY CARS THAT PREVENT WRECKS.
The anti-telescoping and the anti-climbing device.

NEW DEVICES TO STOP WRECKS

By F. B. WARREN

THE entire structure of the Hudson and Manhattan Railroad's standard car is designed with the members so distributed and proportioned as to prevent injury to passengers in case of collision. To this end the full weight of the side frame of the car is in the form of a bridge truss 7 feet 3 inches in height, modified to permit of the use of windows and a center side door. The window openings are also reinforced to prevent strain which might break the window glass with resulting injury to passengers in case of collision. The end sills of the car are in the form of girders, connected to the longitudinal members by heavy flanged gussets and thick floor plates, and the side sills from the ends of car to bolsters are reinforced with heavy bulb angles. The end of the car thus distributes the shock of collision over the entire structure and utilizes the combined strength of all main members to prevent telescoping.

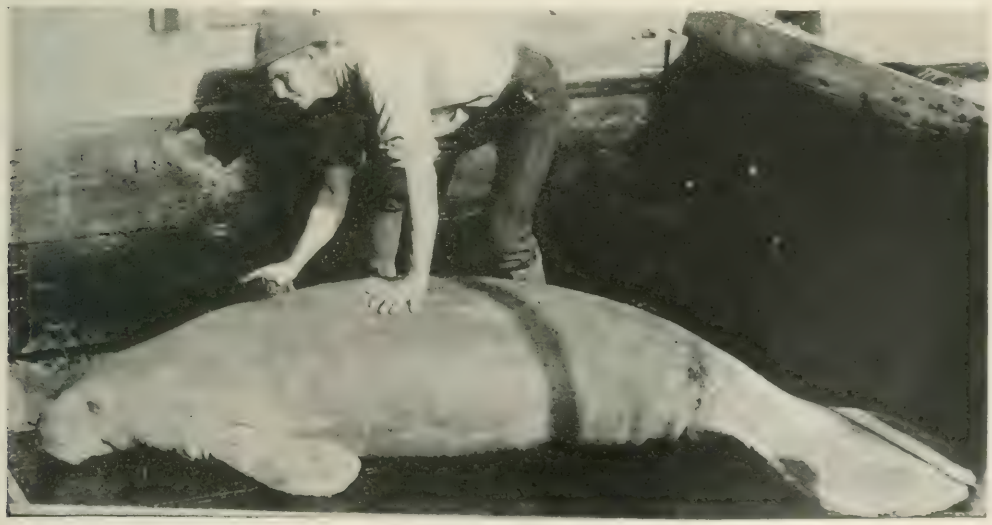
To prevent cars riding over each other when in collision heavy special ribbed channels, known as Hedley anti-telescoping plates, are attached in front of the end sills, the ribs on these plates interlock when cars come together and thus prevent one car riding over the other.

Between these ribbed plates and the end sills are heavy blocks of wood to form a somewhat elastic body to cushion any shock. As a further safeguard to prevent cars from over-riding, there are two massive steel castings projecting eight inches above the floor at end sills of car to which they are attached.

POPULAR · SCIENCE & MECHANICS SUPPLEMENT ·

PASSING OF THE MANATEE

ONE of the most interesting of aquatic mammals is the Manatee, which was formerly numerous all along the coast of the Gulf of Mexico and up the shore of the Atlantic as far as the Carolinas. Attaining a length of ten feet, and a weight of 2,000 pounds, it is a most gentle and harmless creature, living wholly on water plants. Unfortunately, it has been driven almost to extinction by its most cruel enemy, man, the method adopted for its capture being usually to take it with nets, which are stretched across rivers near their mouths, where the beasts are expected to pass. Their carcasses afford a profitable booty, a single skeleton being worth $100, while the skin, if taken off whole, can be sold for a like amount. The meat is very palatable, resembling veal in flavor.



THE DISAPPEARING MANATEE.
Valuable salt water denizen that is being exterminated.

ELEPHANT SURF BATHER

BABY HIP, the small trained elephant which has done many queer stunts of late, was recently given a good time at a Pacific Coast beach, incidentally furnishing amusement for all the visitors to the resort. He was led out into the surf by his trainer where he plunged around in the breakers with all the delight of a small boy, throwing the water about with his trunk and enjoying himself so thoroughly that it was a difficult matter for the trainer to lead him ashore when he had had enough.

Baby Hip is the elephant which rode about the streets of Los Angeles in an automobile about a year ago selling newspapers for charity, a feat which was described in this department.

ELEPHANT SURF BATHER.
Odd method of fun-making in the water at a seaside resort

WHERE COAL BREAKS OUT

THEY dig coal out of the hill-sides and river-banks up in central Alberta. The country is underlaid for great distances with lignite of very good quality, which serves as a local fuel supply and seems likely to solve the fuel problem for the whole Canadian prairie region. The deposits vary considerably in depth but commonly come close to the surface, cropping out on farm-lands, along the rivers, and on the sides of forest ravines. Mines that are now tunnelling for a mile or more underground began by scratching the outcrops on a hill or in the middle of a farm-field. There are numbers of such mines in the vicinity of Edmonton, the capital city, and one of them, on the river bank, used to load direct from its mouth into barges in the river, until the seam worked too far in. Coal-black earth shows here and there over the entire district and immense areas of lignite have in this way been traced away to the north and west. It is one of nature's boons to the settler, who by terms of the Canadian mining law is entitled to all the coal he wants, at the mine mouth, at a price not exceeding $1.75 per ton. The same coal sells in the market at from $3 to $5. Mining methods have been primitive but are now becoming modernized, but the price shows no tendency to fall below what it has been.

WHERE COAL IS MINED CHEAPLY.
Scene at Alberta shaft where the coal is close to the surface.

SMALL GAS PLANT

THE Pacific Northwest, while rich in natural resources, has thus far been found deficient in a supply of natural gas. The smallest, if not the only natural gas plant in this entire section, is to be found in Jefferson County, Washington, and came into existence in a peculiar manner.

Several years ago a company was organized to drill for coal and after boring to a depth of over eight hundred feet through a

SMALL GAS PLANT.
Miniature natural gas reservoir which furnishes a private supply.

sandstone stratum, the drills were lost and the work was abandoned. The hole filled with water and soon it was noticed that bubbles of gas were constantly arising to the surface. By confining this gas in a can and then applying a match to a vent, a flame sprang up that continued to burn for several minutes.

A farmer living near built a basin around the pipe and confined the escaping gas in a floating drum five feet in diameter. The gas, which was then piped to his house, was found of sufficient quantity to light his premises well.

PLANTS ARE WEATHER PROPHETS

PROFESSOR J. E. NOWACK, an Austrian baron and scientist, has established at Denmark Hill, London, an observatory where plants are called into requisition for foretelling the weather. The plants are the tropical abrus. There are some 1,900 of them in the greenhouse of the observatory, all of which were grown from seeds obtained from Cuba and India. In appearance they resemble the common maidenhair fern, but if one watches them closely for any length of time their wonderful susceptibility to atmospheric changes is apparent.

The plants are "read" in conjunction with sun spots. For instance, immediately a spot sufficiently large to influence our earth appears on the sun's surface, the twigs directed towards the district affected perform more or less rapid upward or downward movements. From the rapidity and extent of such movements, and variation of color, it can at once be determined the nature, force, and geographical position of the disturbance that will affect this earth about twenty-six days later, namely, when the sun spot completes its first rotation round the sun.

Professor Nowack declares that from this London station he will be able to issue weather charts several days in advance for a radius of 3,000 miles. He will also be able to forecast the weather for every hour of the day, and to tell whether it will be fine, dull, or whether rain, fog, or thunderstorms may be expected. It is also possible, he says, by studying this plant in conjunction with sun spots and other meteorological data to forecast earthquakes and other disturbances. Indeed, the discoverer of this system of plant-weather forecasting claims that he has foretold all the great natural disturbances that have shaken the earth in recent times, including the catastrophies of Kingstown, San Francisco and Martinique.

If this method is half as effective as its advocate states it will be exceedingly valuable wherever the plants can be grown successfully.

PLANTS AS WEATHER PROPHETS.
Strange growths that are used in study of [illegible]

GREAT ARRAY OF WEALTH.
View in United States Treasury, with $20,000,000 in sight.

VAST WEALTH IN SMALL SPACE

HERE is a lot of money in one little room. The picture shows one of the vaults at the Treasury Department at Washington. It is a rough affair, fixed up with heavy wooden shelves, beneath which are stacked several millions of dollars in silver coins.

There is about $20,000,000 in the vault, including the contents of the paper packages on the shelves. Each package measures about one foot each way, and contains 4,000 notes of $5, $20, $50, or $100 denomination, as shown by the labels. The four bags of silver lying in the middle of the floor contain $1,000 each. Some of the other sacks hold more, and others less.

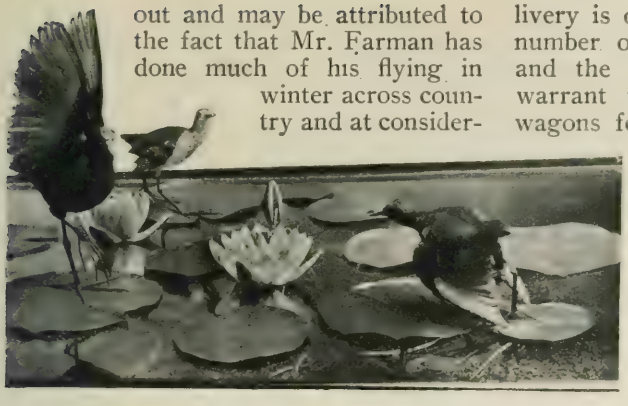
PROTECTION FOR AVIATORS

ALMOST every aeroplanist who has made long flights has suffered intensely from the cold of the upper air and has been almost too benumbed to stand upon alighting. If amateur aviators are to derive any enjoyment from flying it is evident that some protection must be afforded against the cold, raw wind that is created when driving at forty to fifty miles an hour through the air one thousand or two thousand feet above the earth's surface.

Having suffered severely himself from the cold on long flights, Maurice Farman, brother of Henry Farman and himself an aeroplane builder and operator, has given more thought to this matter of protection than any other European aviator. In his new biplane the whole *fuselage* or central portion is covered in with canvas, forming a boat-like structure on the lower plane which of itself gives considerable protection. In addition to this, however, he has built up a wood and canvas scuttle type of dash somewhat resembling the fore deck or the spray hood of a motor boat or the hooded dash of the torpedo automobile body. As this dash rises above the top of the steering wheel, the pilot has only the upper half of his face exposed to the elements, and this can be protected by a cap and mask.

This is the only aeroplane on which protection has been thoroughly worked

PROTECTING AVIATOR FROM COLD.
Covered-in fuselage, which gives boat-like shelter to operator.



BIRD DANCE ON LILY PADS.
Beautiful wooing of the *Jacana* of tropical South America.

out and may be attributed to the fact that Mr. Farman has done much of his flying in winter across country and at considerable heights. There can be no doubt that it indicates a development that is bound to come on all aeroplanes intended for sale to the public.

DANCE OF THE JACANA

THIS is a comparatively little known, but very beautiful bird of tropical South America. It is called the "jacana," and is chiefly famous for the love dance which the males execute in rivalry, to excite the admiration of the females. In this curious dance the wings mainly are waved about and the birds assume attitudes of remarkable charm and grace. Sometimes the dance is performed in a particularly delightful way on lily-pads in still waters, to which the birds resort in quest of insects.

THREE-WHEEL DELIVERY WAGON

THE three-wheel delivery wagon is an evolution from the bicycle with a parcel-carrier strapped in front of the handle-bars, and used to some extent by wheelmen in touring. It gives a speedy wagon of small size and economical operation, for use where especial promptness of delivery is desired, or where the size and number of the parcels to be delivered and the distance traversed would not warrant the employment of full-sized wagons for the purposes of transportation in a limited area.

This handy little "get there quickly" vehicle is really a three-wheel motor cycle, propelled by a small gasoline engine driving the rear wheel. In the small-size wagon, the driver sits nearly over the rear wheel, the load being carried mainly by the two front or steering wheels. The van or parcel box is about three feet deep by two feet square, and the load carried in addition to the weight of the driver is from 150 to 450 pounds, according to the size of the motor—ample capacity for concerns having small, light parcels to deliver quickly. It is also being introduced by public-service corporations for carrying repairmen and arc-lamp trimmers over their routes, and is particularly useful in making good time in suburban and country districts, carrying a considerable load of tools and supplies. It will help materially such classes of workers.

THREE WHEELED AUTO DELIVERY WAGON.
Useful form of vehicle that has recently made its appearance.

GRAIN TRADE OF ARGENTINE

WHEAT from the Argentine Republic has found a ready market in Mexico during the last few months, being sold there in large quantities in competition with United States and Canadian exporters. The importance of Argentine as a grain producing country is constantly increasing. One of the interesting industrial sights of Buenos Aires is the long line of large grain elevators that is spread out along the water front. Modern facilities for handling the grain, such as receiving it from the cars and loading it upon the vessels, are in use. The grain trade to foreign parts is being constantly extended. Wherever an opening for marketing wheat, corn or other products is found the Argentine exporters are quick to grasp the situation and establish their trade.

ELEVATORS AT BUENOS AYRES.
Scene which indicates big grain trade for southern port.

PENITENTIARY USED AS PLEASURE RESORT

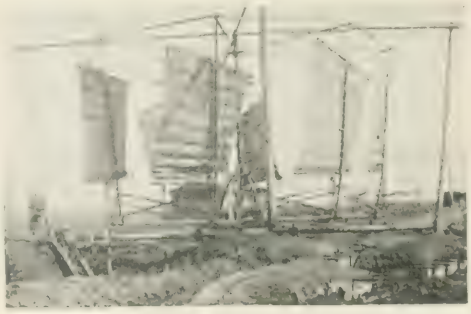
PROBABLY the only penitentiary used as an amusement hall is the one at Yuma, Arizona, which has recently been abandoned, the prisoners being transferred to Florence, Arizona. As the site was given for penal uses, the city of Yuma finds itself with a white elephant on its hands in the shape of a huge institution without any inmates. However, as the little city had no accommodation for the traveling amusement enterprises which came that way, it has now become the custom to have the stereopticon lectures and musical entertainments in the halls of the penitentiary, which is right in the center of town and is now one of the popular resorts of the Southwest.

PENITENTIARY USED AS AMUSEMENT RESORT.
Yuma's transformed prison now devoted to recreation.

TREE GROWS BRUSHES.
Here is a curious desert tree, which flourishes in some of the most arid parts of New Mexico. It yields brushes, practically ready made, for street-cleaning purposes.

WINDMILL FOR SALT-MAKING

THIS picture was taken in China. It shows a very primitive method of making salt—the windmill being located near the sea, and its power being used to pump sea water up into ponds. When the sun has evaporated the water, the salt remains behind, and has only to be gathered for market. A string of



CHINESE WINDMILL FOR SALT-MAKING.
Oriental's queer contrivance which serves an unusual purpose.

such mills, scattered along a mile or two of coast, can turn out a large quantity of salt per month at trifling cost.

A CHURCH IN A DAY

THE energy and indomitable spirit of loyalty manifested by the congregation of the Central Christian Church of Peoria, Illinois, might well be copied by churches in other communities. Organized, yet lacking a place in which to worship, the members set to work under the direction of their pastor and secured contributions of building material and furnishings for a chapel.

On May 30th, Memorial Day, 190 men, members of a local carpenter's union gave up their holiday and began the work of erecting the chapel. The first timber was put in place at 8 a. m. and at the stroke of 6 o'clock on the evening of the same day, on a spot where before there was nothing save a stone foundation, a very neat and serviceable little chapel stood complete, furnished and ready for the dedication which took place the same evening.

CHURCH BUILT IN A DAY.
Laying the first timbers.

CHURCH BUILT IN A DAY.
Getting up the frame.

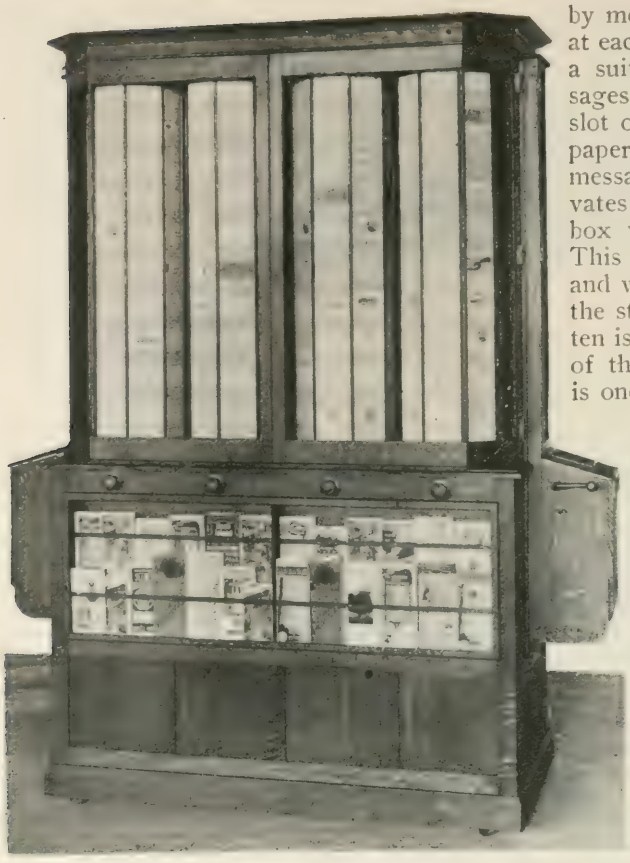
CHURCH BUILT IN A DAY.
Building nearing completion.

CHURCH BUILT IN A DAY.
The finished structure.

The house is twenty-four feet wide, sixty feet long and has a twelve foot ceiling. The outside of the building is weather boarded while the inside is sealed. It has twelve windows, three doors, is equipped with a platform and pulpit, steps at front and back of the house and the outside has one coat of paint. In addition to this, electric lights and such other furnishings as were necessary were installed.

Nearly everything in the way of material and furnishings were donated by the people of Peoria. In this way the church was able to erect a building which would under ordinary circumstances have cost from $1,500 to $2,000 at a total cost of $525.00, all of which was paid in cash, leaving the church free from debt.

One of the local papers in commenting upon the work editorially stated that it would do the church more good than the erection of a $30,000.00 building in the ordinary way, beside bringing the laboring man more closely in touch with the church and making friends for both.



FINDER OF LOST PERSONS
Useful device for sending messages without a messenger.

by means of an electric motor, and at each end of the cabinet is located a suitable device for writing messages. By placing a nickel in the slot on the writing table a strip of paper is exposed and upon this the message is written. A lever elevates the message into a display box where it is exposed to view. This box will hold ten messages and when these have been recorded the strip upon which they are written is removed and placed upon one of the revolving cylinders. There is one cylinder for each day of the week and an "extra" for "today's" business.

Other uses for the cabinet besides the display advertising feature, are in tracing lost articles, making business or social engagements and in brief taking the place of the "want ad." department of a newspaper. Its greatest advantage is to people who are expecting friends at the railroad station and are too busy to wait around for delayed trains.

It is a simple matter for such persons to write a message and lift it into the machine's space for such records, and if the arriving friend has been prepared to expect a missive of the sort, he can readily find it. Until the machine is in general use, however, it will help little to put a message into its keeping. Such a contrivance could be made to serve a useful purpose, however, with proper advertising of its merits.

MECHANICAL FINDER OF LOST PERSONS

OF greatest interest to travelers is a new invention of a Los Angeles man. It is briefly described as follows: An oblong glass cabinet enclosing eight octagonal cylinders which are revolved

BAKE OVEN ON HOUSE-TOP.
View in Pueblo Indian village near Santa Fe, where the unique plan of baking on the roof is followed.

UP-TO-DATE SCISSORS GRINDER.
One man's curious outfit that utilizes power for work or locomotion.

UP-TO-DATE SCISSORS GRINDER

IT has often been said that the advent of mechanical operation has killed the small industries, but recent developments in engine design, especially the construction of gasoline engines, are bringing about an opposite tendency, and the individual artisan frequently finds a powerful help in the adoption of such motors for driving his tools, or operating a dynamo which in its turn supplies current to a number of small electric motors.

That even the most humble workman may derive profit from the use of machinery is strikingly shown by the accompanying photographs representing certain clever scissor-grinders who have recently fitted their grindstones with gasoline motors enabling them to carry out their work more rapidly and efficiently than their competitors.

One of these men has carried his invention further than the other and makes his engine propel his machine as well as turn his grindstone for him. The other is content to push his cart without getting more benefit from the device.

ANOTHER INVENTIVE GENIUS.
Using gasoline to turn the grindstone.

THE OLD WAY AND THE NEW.
A novel snapshot taken recently in an English lane shows an up-to-date sixty horse-power automobile at the side of a caravan in the shafts of which is an elephant. An odd contrast between the modern and ancient modes of transportation.

EUROPEAN GASOLINE PLOW

THE accompanying illustration shows a most interesting type of gasoline motor driven plough and cultivator constructed in Switzerland.

The secret of success lies in the fact that in this machine the problem of mechanical ploughing is on the principle of replacing the plough by the hoe. Men have used this tool, the hoe, long before they learned to employ animal force for pulling their ploughs and at all times, farmers who wanted to work a field specially well, returned to the use of it. Imagine several rows of hoes, fixed on a revolving drum, which is fastened at the rear of a wagon and driven by any kind of motor, which at the same time propels the wagon. Such a combination permits the hoeing of a strip of great breadth to any depth desired, with the minimum of energy necessary, because the car works itself forward by the action of the drum and the hoes. For this reason the car itself can be made very light and requires a comparatively small motor, leaving the field thoroughly worked to any depth required ready for sowing. It is worked by one man alone.

Each machine is supplied with a number of sets of attachments varying according to their application. A thirty-five horse-power gasoline motor is used and the tractor makes a speed of four miles per hour.

NEW EUROPEAN GASOLINE PLOW.
Strange form of toothed hoe that digs the ground for Swiss farmers.

NEW OHIO ICE HARBOR.
Protective shelter for river vessels near Cincinnati.

GOVERNMENT ICE HARBOR

TO protect craft from dangerous ice floes and gorges moving down stream in the Ohio River, the United States government has built an expensive concrete ice harbor for craft in connection with the new million dollar dam, twelve miles below Cincinnati, which will soon be opened for business.

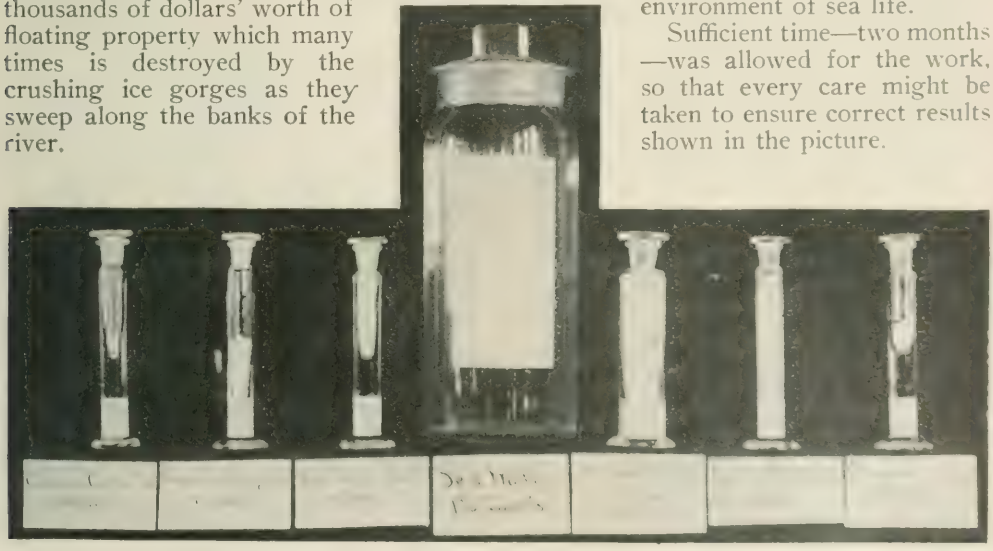
This new ice harbor is the first of its kind to be built in the Ohio River and the first one built by the government. It will afford protection for thousands of dollars' worth of floating property which many times is destroyed by the crushing ice gorges as they sweep along the banks of the river.

WHAT IS SEA WATER?

THE accompanying photograph was taken at the laboratory of the United States Bureau of Fisheries, located at Beaufort, North Carolina, and shows the different salts obtained from one and three-quarters quarts of sea-water.

No careful analyses of sea-waters along the Atlantic or Pacific coasts of the United States have been reported, but the biologist has become interested in the chemical composition of sea-water, because it is a feature of the environment of sea life.

Sufficient time—two months—was allowed for the work, so that every care might be taken to ensure correct results shown in the picture.



WHAT SEA WATER CONSISTS OF.
Results of chemical analysis of ocean's makeup.

DONKEY LEADS CAMELS.
Diminutive guide of tireless desert workers.

DONKEY LEADS CAMELS

THE camel, of course, is the beast of burden of the East, and the varied work to which it is put is virtually endless. It is used for carrying freight or passengers across the desert places, for work in the fields, for turning water, grinding corn, etc. They travel leisurely along in single file, always led by a little donkey, carrying a tinkling bell. The camels follow this creature one behind the other and their leisurely tread of three miles an hour has a regularity of clock-work. They have often been timed with the watch with the invariable result that the pace all through the day and at its close is exactly the same as it was at the beginning. A single animal will carry a load of five hundred to six hundred pounds.

JUST MORNING GLORIES

HOW to make trolley, electric light, telegraph and telephone poles anything more than eyesores is a problem that many an advocate of the "City Beautiful" has pondered over in vain. Possibly the best solution is the discovery of Mr. George W. Long, Park Superintendent of Long Beach, California. Five years ago he planted a few morning glory seeds at the foot of a guy line to an electric light pole in front of his property. His morning glories are now one of the sights of that beautiful little beach city. In the genial climate of southern California the morning glory is a perennial, growing and blooming winter and summer. Consequently, the vines he planted now form a mass of bloom and foliage from the foot of the guy line to the summit of the pole. By actual measurement this morning glory skyscraper is twenty feet in circumference, and is still growing.

Naturally the success of Mr. Long's experiment has resulted in imitation, and guy wires all over the city are being similarly transformed into real things of beauty. Several have obtained a good start in Los Angeles; and it now appears that the morning glory is likely to become as characteristic of southern California as the rose and poinsetta.

OXYGEN FOR FIREMEN

FIRE departments in a number of our principal cities are buying oxygen outfits for use in emergencies — particularly where smoke is so thick as to forbid entrance into a burning building without such an equipment. These two pictures show the very latest style in outfits of the sort. A man provided with such a helmet and reser-

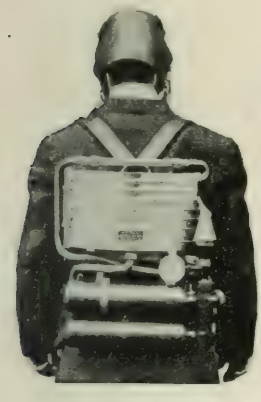
OXYGEN FOR FIREMEN.
New device for life-saving.

NOTHING BUT MORNING GLORIES.
Beautiful decorative idea at a Western resort.

voir could live in the densest smoke for two hours. At the same time, with the help of an electric storage-battery lamp, which he carries, he can see his way about.

SAVING HISTORIC TREE

THERE are a number of historic trees in Mexico. One of them is the ancient cypress under which Hernando Cortez, the Spanish conqueror of the Aztecs, is said to have stopped and wept as he was being driven from the capital by the native horde of fighters. The tree thrived during the centuries that have passed since those early tragic days, and it was not until a few years ago that it began to show signs of decay. The Mexican government has had an iron fence erected around its large and gnarled trunk in order to protect it against the vandalism of relic-hunters. Scientists were employed to treat the decayed parts of the tree and to give it a new lease of life, if possible. This attention had the desired effect for a time, but it is noticed that its life is slowly ebbing away, and it is thought that it can live but a few more years at the most. When it finally dies its trunk will probably be cut off near the ground and removed to the National Museum.



OXYGEN FOR FIREMEN.
Tank carried on the back.

SAVING HISTORIC TREE.
Famous Cortez cypress that is being protected from destruction in Mexico.

PRIVATE IRRIGATING DEVICE.
Flume on Arizona ranch that brings needed water.

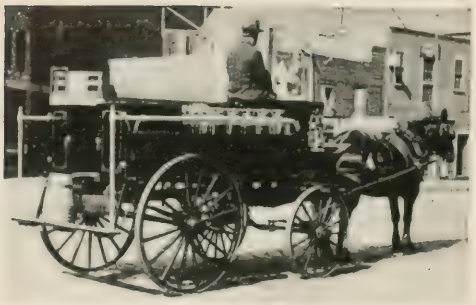
NOVEL IRRIGATION

SEVERAL years ago a mining man, living in Bisbee, Arizona, observing that the water pumped from one of the shafts was running to waste, decided to utilize it. Accordingly he took up 160 acres of land in the San Pedro valley several miles away and proceeded to construct a flume from the mouth of the shaft around the hills and across the railroad tracks to this piece of arid ground. Today this 160 acres, which is visible from the train as you approach Bisbee, is one of the finest ranches in Arizona. Splendid horses and cattle pasture knee deep in emerald green alfalfa and the whole place speaks of fertility and prosperity. The water from this remarkable irrigation system crosses the railroad tracks twice, once above in a flume, once below through a culvert.

This is probably the only farm on earth which is irrigated by means of the waste water pumped from a mine.

WIRELESS FOR SIBERIA

THE Russian government is contemplating the establishment of an extensive system of wireless telegraphy across Siberia, and probably also a network of communications over Russia proper. A number of tests are being made with different systems looking to a large installation.



To Fight Forest Fires.
Wagon fitted with chemical engine and tools for quick action.

FOREST FIRE WAGON

THE State Forester of Massachusetts has just inaugurated a vigorous campaign for the prevention of forest fires. In connection therewith he has had built under his supervision, a wagon for fighting forest fires, as shown in the photograph.

This is probably the first forest fire wagon ever built expressly for the purpose of fighting them and is of a very solid and lasting construction. The body is very much on the order of the ordinary chemical engine with side rails and extinguishers. The equipment includes extinguishers, shovels, hoes, axes, rakes, lanterns, buckets and Marshfield cans.

THE "PUMPMOBILE"

WHEN we want to speak of anything as being absolutely useless we refer to it as "the fifth wheel," but a boy inventor in Los Angeles has designed and constructed a combination of bicycle and coaster in which the fifth wheel plays the most important part. He calls it the "pumpmobile," which refers to the motive power, a pair of boy's legs on the bicycle end of it. As the illustration shows, the frame and rear wheel of the bicycle is attached behind a home-made coaster and the inventor, who sits in the front seat, has nothing to do but steer and apply the brakes; his friend does the necessary pumping.

The steering is done by a wheel between the knees of the driver, and the signal for pedestrians to get off the sidewalk is in the form of an electric bell rigged up by the youthful inventor.

Fifth Wheel in Good Use.
Los Angeles boys make sport of old saying.

FISH BY THE TON

TONS upon tons of small fish are caught and dried annually in California by the Japanese, who have established a fishing village at Santa Monica. The illustration shows the fish as spread out upon wire screens in the drying process. The sun alone does the work. After the drying is finished, the fish are packed in boxes and shipped to the mining camps of the west, where they are a staple article of diet among the Japanese and Chinese.

One of the favorite delicacies is candied shark. This confection is prepared by drying the despised shark layer upon layer, sprinkled with sugar. This commands a fancy price.

Acres of Fish.
Japanese fish-drying plant at Santa Monica.

MOST WONDERFUL APPLE TREE

THE apple tree shown in the illustration was grown without irrigation from a seedling planted by Central R. Frazer in 1866, two years after he settled in the valley, at Dixie, Washington. It is forty-two feet in height and its branches spread fifty-seven feet from tip to tip. The trunk is seven feet in circumference at the base and measures six feet six inches just below the first limb, which is four feet from the ground and measures four feet seven inches. The tree is sound and healthy, despite the fact that it has produced fruit every season for nearly forty years.

Experienced growers predict that this tree will yield between 150 and 200 boxes of fruit this season, breaking its record of 126½ boxes in 1907, the highest production from a single apple tree known anywhere in the world. The tree bore 70 boxes in 1906, 42 boxes in 1908 and 45 boxes in 1909. More than 500 barrels of fruit have been picked from its limbs since it came into bearing in the spring of 1871.

REMARKABLE APPLE TREE.
Fruit bearer that has had extraordinary growth.

The fruit is of a mild subacid to sweet flavor, of fair quality and very firm, and will keep through the entire winter.

RECORD BREAKING TRACK WORK.
Twenty-one minutes sufficed here to lay three-quarters of a mile of rail.

RECORD-BREAKING TRACK WORK

A RECORD was established in track laying on the line of the Lake Shore and Northern Railroad near Syracuse a short time ago when it became necessary to replace nearly a mile of 56-lb. rails with 70-lb. rails without interfering with the running time of the trains.

Nearly three-quarters of a mile of 56-lb. rails were removed and replaced with the heavier rails in the quick time of twenty-one minutes and two seconds. Before starting on the work the new rails were laid beside the old ones already bonded together and with the spikes distributed at regular intervals so that the least amount of time would be required in doing the work.

The work was done in much shorter time than was thought possible and the cars were enabled to maintain schedule time as though the removal of a mile of trackage did not interfere with the running of the road in the slightest. The gang was proud of this achievement.

HOW THE FINISHED TRACK APPEARED.
Seventy pound rails substituted for lighter ones in quick time.

EFFECTS OF MANHOLE EXPLOSIONS

AN accumulation of sewer gas caused an explosion on the streets of Los Angeles recently, which sent the heavy iron cover twenty feet into the air and wrecked the thick asphalt pavement for an area of several yards in all directions.

The photograph shows the hole with the cracks radiating from it as if an earthquake had jarred the street. A fragment of the iron cover is also shown in the foreground.

An automobile had just passed over the manhole and was only six feet away from it when the accident occurred, but except for a splashing of black mud it was not the worse for the narrow escape.

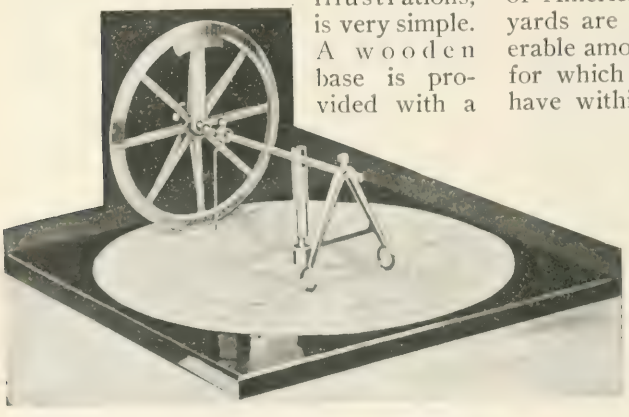
WHERE SEWER GAS EXPLODED.
Manhole setting wrecked by a blow up.

MACHINE AVERAGES CIRCULAR CHARTS

SINCE the introduction of recording gauges and meters some years ago, the need of some simple method of obtaining the average of the record made for twenty-four hours has been greatly felt. A device for ascertaining this average has lately been invented by an Eastern man and is proving very efficient, and no matter what the nature of the record may be upon the chart, the average can be quickly and accurately secured by the use of this instrument.

The construction of the instrument, as shown in the illustrations, is very simple. A wooden base is provided with a metal socket, upon which the chart is supported and centered. This socket holds an upright pin with a slot in the upper end for receiving the bar carrying the tracing point and reading wheel.

To operate the instrument the thumb and forefinger are placed in the rings at the base of the triangular support and the pointer is thus guided to follow the record line as the chart is turned with the other hand. By referring to a line platted on a sheet of cross-section paper, furnished with the instrument, for the particular record curve that is to be measured, the total reading for the twenty-four hours can be taken off.



MACHINE AVERAGES CIRCULAR RECORDS.
Useful invention of an Eastern man proves successful.

STEAMERS ON "UNNAVIGABLE" WATERS

STATISTICIANS may justifiably deplore the comparatively small output of American shipyards, but these same yards are responsible for a very considerable amount of tonnage in home waters for which they are not credited. They have within a few years quietly put in operation a fleet of steamers whose tonnage does not add a particle to the registered total under the American flag, whose names are not seen in the list of merchant vessels of the United States, and whose very existence is not known to many people.

They are the steamers plying on the lakes inaccessible from the sea, on which

WORLD'S LARGEST TREE TRUNK.
Base of big tule that is said to hold the record.

transportation has lately developed to such an extent that nearly every body of water with sufficient depth to float a passenger steamer now boasts a fleet of its own, not only of the antiquated sidewheel pattern, but frequently of the more modern propeller type. The newer boats of these growing fleets are usually built of steel, their parts being gotten out at shipyards on the coast or Great Lakes, then shipped inland to the shores of the lakes and assembled. In former years the pioneer boats, wooden, were set up on the spot by master builders sent from the coast yards.

Particularly in New England, whose surface is dotted with diminutive lakes, this undocumented fleet has recently increased, and there are now lines of steamers there on Lakes Moosehead, Rangeley, Sebago, Winnepesaukee, Squam, Sunapee and Memphremagog. For the reason that the Bureau of Navigation considers as navigable waters only those "navigable to sea going vessels," or accessible from the sea, these steamers are neither subject to government inspection nor bound by the international or inland rules of the road which apply to their brethren on the coast and Great Lakes.

Though the supervision of the state governments, by which they are regulated, is of much the same order in its main features, more laxity in management is apparent. Some of these lake craft lack an engineer, and their machinery is controlled from the pilot house, while lapses are often observable in the manner of placing names, both of which irregularities would bring reprimands from the inspectors if on the coast or Great Lakes.

On some of these lakes, not more than twenty miles long, steamers apparently as large and well equipped as the average excursion boat are in service. To the lover of open, white-crested sea the steamers ever look out of place in such contracted surroundings, and the thought of their two hundred feet or more of length being for all time confined by the wooded shores of tiny lakes, is decidedly incongruous.

WORLD'S LARGEST TREE TRUNK

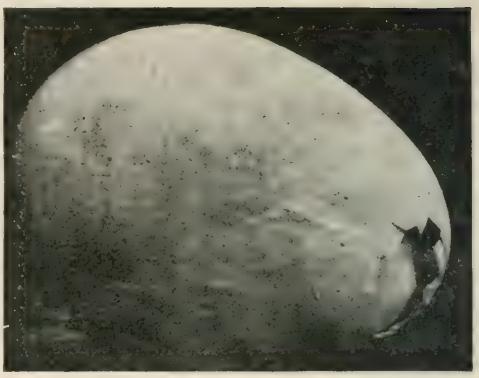
THE trunk of the giant tule tree which stands in the churchyard at Mitla, Mexico, measures over one hundred and forty-five feet in girth. It is said to be the largest tree trunk in the world. It is one of the wonders of Mexico and is visited each year by many tourists who are attracted to Mitla by the prehistoric ruins that make the little town famous. The age of this great tule tree cannot be estimated with any degree of accuracy. It has had no perceptible growth since the first record of its size was made more than three centuries ago but it is believed to be several thousand years old.

NAVIGATING "UNNAVIGABLE" RIVERS.
Boats on waters that are not recognized officially as open to navigation.

PAINTING OVER CRACKED WINDOW

A JAPANESE merchant on the Pacific Coast was unable to get his landlord to replace a cracked show window. This grated on his artistic sense and with truly Oriental ingenuity he proceeded to make that crack in the window a thing of beauty. Therefore he took his paint brushes and colors, got on a ladder and carefully painted a graceful young tree on the glass, the stem of which followed the sinuous line of the crack, concealing it entirely. Where another large crack ran out from it he traced a branch. Twigs and leaves covered the smaller fractures, until when he was finished he not only had hidden the damage to his store front but had made it a charming piece of decorative work.

The first tree he painted represented a maple in Autumn foliage, then when Spring came he decided this was unseasonable so he washed it out and painted a cherry tree in full blossom. That is the one shown in the photograph and is the last one done by this clever Jap in that locality, for about that time his lease expired and a firm of Americans leased the premises.



DOUBLE EGG.
This egg is double, as can be seen at the cracked end. It weighed 2700 grains, when found in the body of a dead hen.

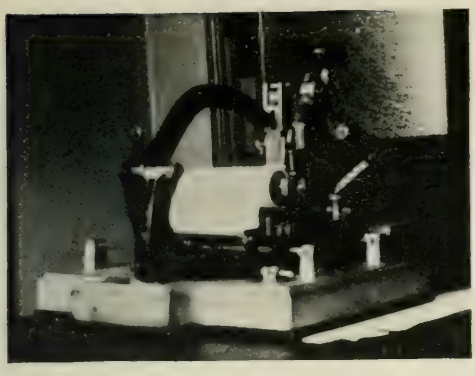
REPAIRING DAMAGED STEAMER.
One ship on which swift mending was done after accident.

BRIGHTEST OF FIREFLIES.
West Indies beetle that has great reputation for brilliancy.

HOW OCEAN STEAMSHIPS AREREPAIRED

SOME great dry dock companies have set high records of repairing badly damaged ocean steamers very rapidly. Work on the *Florida* of the Italian Lloyd, which early in 1909 collided with the White Star liner *Republic,* was begun promptly on March 19th, and early on the 23rd, the steamer was placed in dock and the damaged bow severed by means of pneumatic tools. The damaged parts were then raised in one mass by a giant crane, and replaced by the new beak-head (cast and delivered within four days after being ordered, which is likely to be another record) and then the work of placing the steel plates in position was begun.

On April 11th, all repairs were completed in every detail, and the *Florida* was in as good condition as she was before the accident. This is believed to be record time for the class and quantity of repairs needed.



STAMP-AFFIXING MACHINE.
Device that makes unpleasant task easy.

STAMP-AFFIXING MACHINE

OUR London correspondent writes that a machine which cuts, moistens and affixes stamps to letters, newspapers and circulars at the rate of 4,000 per hour, and automatically registers the value of each stamp used has been submitted to the British Postmaster-General by Mr. Charles A. Hanton of London. The advantage of the Hanton machine is that it will hold 50,000 or more stamps at a time, and may be had either six stamps wide for the office machine or twelve stamps wide for government purposes, so that the ordinary sheets supplied by the postoffice may be used either in their original form, or simply torn in half for the smaller machine. It is claimed that it is impossible for the operator to put the machine out of order.

ODD WAY TO BURY A MAN.
This is the way they "bury" a native Alaskan. The defunct is placed on a soidly built platform, which is sometimes weighted with logs, or otherwise protected, to prevent its destruction by storms. Thus uplifted above the ground, the remains enjoy a certain amount of security from wild animals.

ELECTRIC ERASER

EVERY draftsman knows that at times errors are made in tracings which must be erased, also that at times certain changes in tracings already made are desirable. It is necessary, in erasing ink from tracing cloth, to use a light swift stroke, otherwise the surface of the cloth becomes injured and scarred. Few draftsmen have the time to spare, much less the patience to erase long lines as they should be done, but are likely to bear on more heavily than is best, to the detriment of the tracing. A large manufacturer of electrical apparatus in the east has recently brought out a revolving electrical eraser which seems to fill a long felt want in this direction. A motor is connected through a flexible shaft to a circular eraser and this is rapidly revolved while the operator applies it to the work. A small cleaning rubber bears lightly on the circular one as it revolves in order to remove the ink which collects rapidly when the machine is in operation. The pressure of the cleaning rubber is regulated by a sliding sleeve upon the handle. By means of the flexible shaft a very large drawing can be quite easily covered.

SAVES A DRAFTSMAN'S TIME.
Electrical eraser proves a valuable help.

PHOTOGRAPHING HIMSELF.
Device by which lone traveler may prove his records.

SELF PHOTOGRAPHY MADE EASY

A LOS ANGELES inventor has designed a clever apparatus for self-photography. It consists of a metal tube about eight inches long and one inch in diameter which contains a tiny battery that operates the shutter when a button is pressed. This tube hangs on the tripod as shown in one illustration, and the operator who desires to take his own picture holds in his hand the other end of a tiny wire, of any desired length, and a simple pressure of one finger can make either a snapshot or a carefully timed exposure. Of course the photographer must first focus his instrument on the spot where he is to stand, thus making sure that he will be "in the picture." One of these pictures shows the value of the device to solitary tourists or explorers, as it was snapped by a mountain climber who made the ascent of a peak without a companion and was able to bring back a number of successful photographs of himself on the summit.

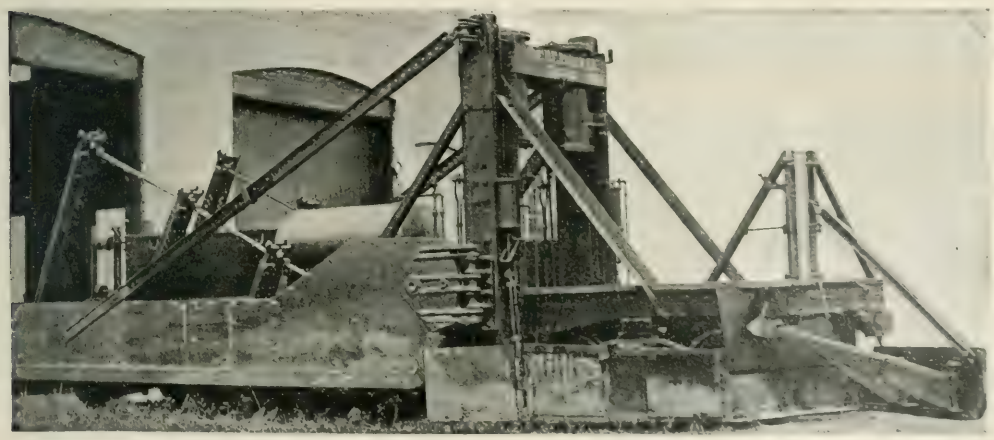
MACHINE DOES 1,200 MEN'S WORK

A PNEUMATIC combination plow and spreader for railroad work is shown in the accompanying illustration which can do the work of 1,200 men, filling to the fullest capacity the places of a ballast plow, flanger and scraper as well as bank builder and spreader. Several

HOW THE MACHINE IS SET UP.
Camera and operator face each other with electric wire establishing connection.

of these pneumatic earth spreaders are in operation on the Isthmian Canal at Panama. It will be noted that the forward end of plow and scraper are raised by an air cylinder immediately above the forward end of plow and on top of the car and the rear ends are raised by air cylinders attached about the middle of the stationary posts. The wings hinged to the rear ends of plow are for the purpose of carrying material over the openings between such ends and the large wings, and are thrown forward when not in use. The plates on the forward end above the plow are for the purpose of preventing snow or other material from being thrown over the top of the plow. The two plates opposite the oil boxes are hinged and can be thrown open when it is desired to oil the boxes or do other necessary work on the truck. The plow can be adjusted to any position between the top of the rails and ten inches above same. It is claimed that generally the power utilized for handling all kinds of material can be obtained with the same engine and crew which handle and unload the material. Therefore the only cost will be for one man operating the machine and the small amount of coal, oil and waste consumed while doing the work. The machine can be operated from either end of an engine, or from the rear end of a train. It does the work of a big gang and has been voted a success by those who have watched its tests.

THE BOY SCOUT.
This is the costume in which some of our military enthusiasts wish to put all our boys, for training as possible soldiers.



MACHINE DOES A BIG GANG'S WORK.
Railway grading machine that spreads and levels earth along new track.

PHOTOGRAPH OF THE SUN.
Picture taken by new apparatus of California priests.

CURE FOR INSOMNIA

IT is a well-known fact in medicine that sleeplessness is caused by a too great rush of blood to the head and brain caused by deep thinking, reading, trouble, etc. Any way possible to lessen the amount of blood taken to the brain helps to render the person able to doze off. Many things can do this—a little cayenne pepper swallowed so that the stomach burns and calls for help, blood consequently rushing there and leaving the brain, is one way. But a far easier and less painful one is to exercise the lungs in deep breathing, for as the patient gets drowsy the breathing shades off into regular sleep. This has been tried time and again and hardly ever fails to work. The thing to do is to fill the lungs as full as possible and slowly expel the air. The process should be kept up till sleep results, which is generally under five minutes. The process of counting till one falls asleep does not seem to work very well. If one can count automatically and with a minimum of brain work well and good, but if the mind has to be put on it the very exercise of the brain prevents it from lapsing into a state of rest.

MEASURES AEROPLANE'S ALTITUDE IN FLIGHT.
Instrument called the Barograph that registers height of air craft from the earth.

STANDARD COTTON GRADES

EVER since cotton became the great "money crop" of the South, the utmost confusion has existed in the matter of grading, and because of the fact that local buyers, to be on the safe side, have undergraded, an enormous loss to the planters has resulted. There are nine grades of American cotton recognized by manufacturers, and while the difference between one grade and the next is microscopic, a very small difference in valuation per pound amounts to a large sum in the aggregate. As a matter of fact, the variation by local buyers from the true grades probably amounted to from one-half to one per cent, in a season, or about $8,000,000. Most of the local buyers are not cotton experts, but merchants and others in the small towns who buy cotton from the planters as a side line.

Now, however, the Department of Agriculture has prepared sets of standard samples, the work being done by a special

HOME MADE TELESCOPE CAMERA.
Device made by California priests for taking astronomical photographs.

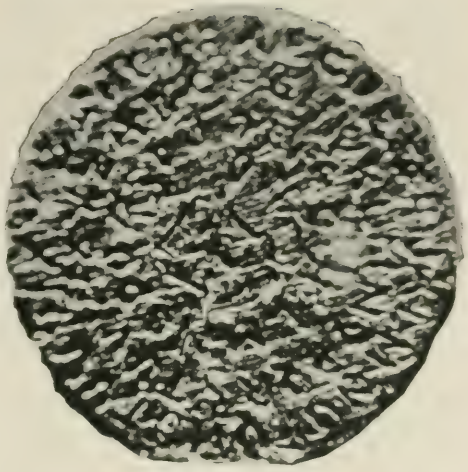
committee of men familiar with the conditions of the trade and selected on account of technical skill, high business standing, and personal integrity.

The standard grade samples are put up by the Department in nine boxes, a set of standard samples being sold by the Department for $35. With good care, the standard samples will last a year before they begin to deteriorate or change color. This question of color change has been the great barrier to previous attempts by exchanges and large buyers to establish standards, and the Department of Agriculture is not undertaking to prepare permanent sample grades, but to standardize a single crop. New samples will be prepared in approximately a year's time.

THIS IS A COMMON PIN.
Tiny article of the toilet on which remarkable engraving was done. See illustration above.

After the standard grades had been selected with utmost care by the committee of experts, they were put into big glass tubes, the air exhausted, and the tubes sealed like incandescent light globes. The cotton buyers, on receiving their standard samples, will use them to match the cotton offered for sale.

The manner in which local buyers sample cotton bales is largely responsible for the dirty and ragged condition in which American cotton reaches the mills. The general practice is to make two long slashes in the jute bagging in which the bale is wrapped, and pull out several handfuls of the staple, leaving the bale in that condition. If the bale is resold, the same process is repeated, so that by the time a bale of cotton first marketed in a small inland town reaches tidewater, the bagging, which, to start, was scanty and insufficient, is cut to rags, and the exposed lint has picked up dirt and trash from fifty dirty platforms and railroad cars.

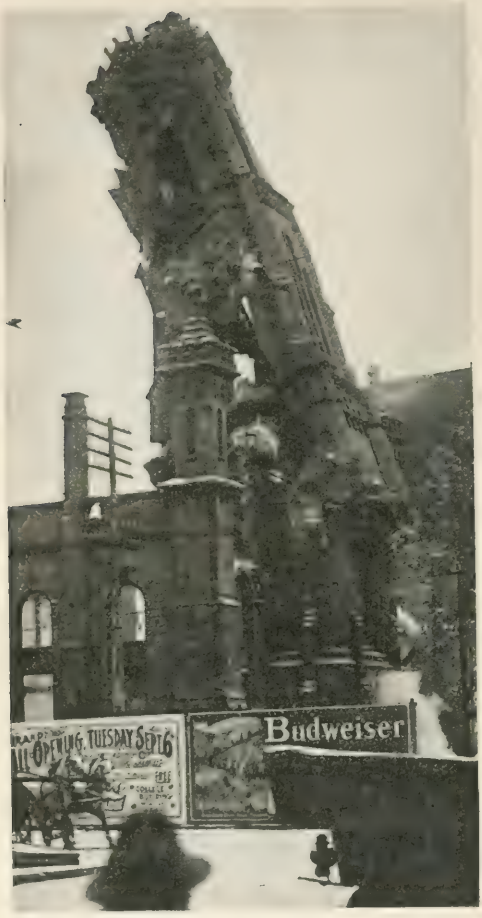


HEAD OF PIN CONTAINS THREE ALPHABETS.
Remarkable engraving done by Fred W. Koehler. Sharon, Pa.

ARTIFICIAL ROE FOR BAIT

EXPERIMENTS have been carried out in the Bay of Biscay to ascertain whether artificial roe could replace cod roe as bait in sardine fishing. The artificial roe is made of fish refuse; its color is brown and it is granulated like fish eggs. The price of this roe, about 2½ cents per pound, is much lower than the Norwegian cod roe now used, the cost of which is from 7 to 10½ cents per pound.

DISASTROUS EFFECT OF SAMPLING.
Cotton bales much torn and slashed by present methods.



UNUSUAL VIEW OF FALLING STEEPLE.
Pulling down the steeple of the First Presbyterian Church, Columbus, Ohio.

LOSSES IN SPONGES

THE prodigality that characterizes the waste of the sponge resources is viewed with much concern by the bureau of fisheries. It is said that thousands of commercially worthless small sponges are gathered and thrown away, and that if such sponges were permitted to stay only six months longer they would add a full $100,000 to the total value of the annual output of the Florida fisheries. In one case a dealer stated that some fishermen had brought him a lot of sponges for which he paid only $5, and that if they had been left only six months longer they might have been worth fully $400.

Sponges have enemies as well as other animals, and they try as best they can to protect themselves. One of these parasites is a long sea worm, which gets into the outward flowing canals of the sponge. It makes for itself a kind of paper tube in which to live, the walls of the tube being very thin and resembling paper when dried. It gets into the sponge by boring up through the base attached to a rock. Some of them measure as much as two feet long and almost dam up the outgoing canals.

TRACTOR FOR PLOWING

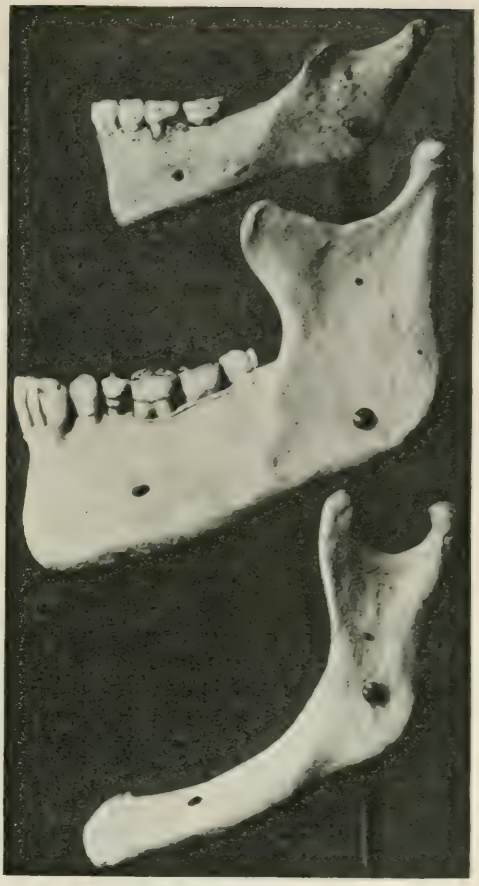
A NOVEL English tractor for agricultural service is utilized to advantage for hauling grain and other material by

WHERE WASTE CAUSES SERIOUS LOSSES.
Sponge market that is feeling the drain of prodigal methods.

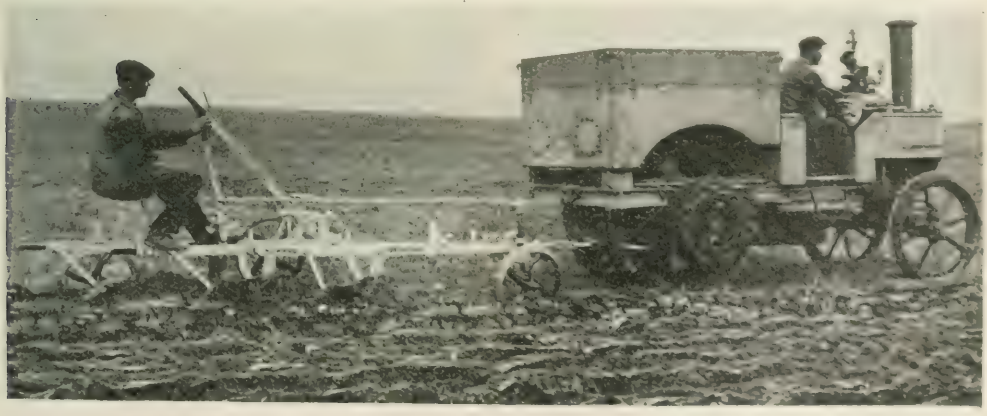
means of a trailer; also for plowing on the farm and driving a threshing machine and doing other agricultural work. The principal point of difference between this and an ordinary steam tractor is that instead of the ordinary hind wheels coming outside the horn plates or girders it is provided with two extra wide roller wheels which come between them. The advantage of this is that the weight of the engine is distributed over a great width of ground, and the hind wheels do not travel over land which has already been run over by the front wheels. Moreover, by running close together they travel over the last narrow strip of unploughed land.

HISTORY OF A JAWBONE

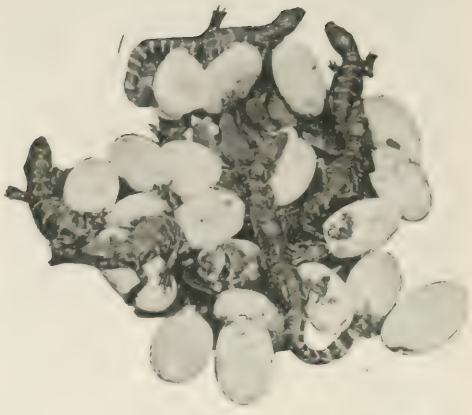
THIS photo illustrates the history of a human jaw. At the top is the jawbone of a child. Below it is a grown person's jawbone. And at the bottom is all that remains of the jawbone of an old man who has lost all his teeth. The teeth, of course, are not set in the true bone of the jaw, but in a structure of a less permanent character known as the alveolar process. When the teeth are lost, this structure shrinks and eventually disappears, leaving only the relatively thin strip of jawbone. Thus it comes about that chin and nose approach each other, and the very old person acquires the peculiar appearance of shrunkenness.



LIFE STORY OF A JAWBONE.
Bone at top is that of a child; the middle one, of a grown person; at the bottom, that of an old man, who had lost all his teeth. The comparison is interesting, as showing the shrinking of the jaw in an old person after the teeth are gone.



TRACTOR AT WORK PLOWING.
New form of engine for farm use, at work in field.



AN ALLIGATOR'S NEST

CONTRARY to the general belief the wild alligator is still to be found in large numbers in the Everglades of Florida. Indeed, the surveying parties of the Florida East Coast Railroad Extension were more than once attacked by these ferocious beasts. It is seldom, however, that a nest with the young just breaking out of their shells is discovered. Recently, however, a naturalist-photographer met with such luck and the result is shown in the accompanying photograph.

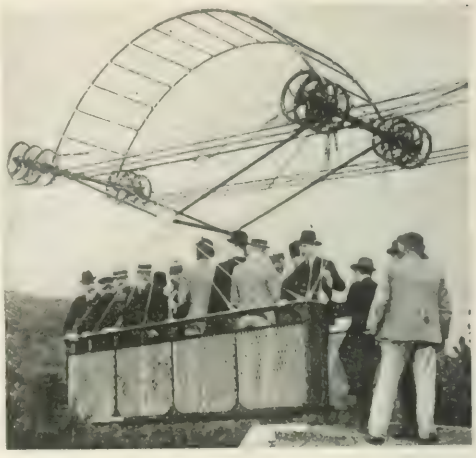
There were twenty-three eggs in the nest, not a particularly large number, considering that these creatures often lay from thirty to sixty eggs in a single nest. They are similar in shape to an ordinary duck egg and about three inches in length. When they first appear the young alligators are about the same size as lizards and almost as lively. They make ideal pets.

NEW COMPOSITE MOTOR BOAT

THE life boats carried on most sail and steamships for many years have been made of galvanized steel. After a time the bilges or bottoms rust through making the boat useless and impossible to repair by patching, as the rust extends widely. Usually the coaming and top sides is sound and good, also stern, stem and keel. There are many of these discarded boats about. They are roomy good sea boats and make excellent motor boats.

The boat shown in the illustration was twenty-two feet long, six foot beam and four feet five inches extreme depth at stem and stern. It had seen twenty years' service on a Hudson River steamboat.

LIFE BOAT MADE OVER.
Stanch craft that was rebuilt into a motor-boat.



NOT QUITE AN AIRSHIP.
Odd craft that carried British visitors across Spanish river on cables, recently, near San Sebastian.

The bottom was gone when the boat was taken in hand by a Hudson River boat builder. She was converted into a motor boat by building a new wood bottom with a keel and putting in a nine horse-power, double cylinder reversible motor near the stern. She is intended for a passenger or work boat and goes easily ten miles an hour. The interior view shows the engine installed without altering the original arrangement as a life boat.

BREEDING BACTERIA

THE accompanying picture shows the results of a very interesting experiment which has been made in order to test the value of the inoculation of beans with nitrogen bacteria.

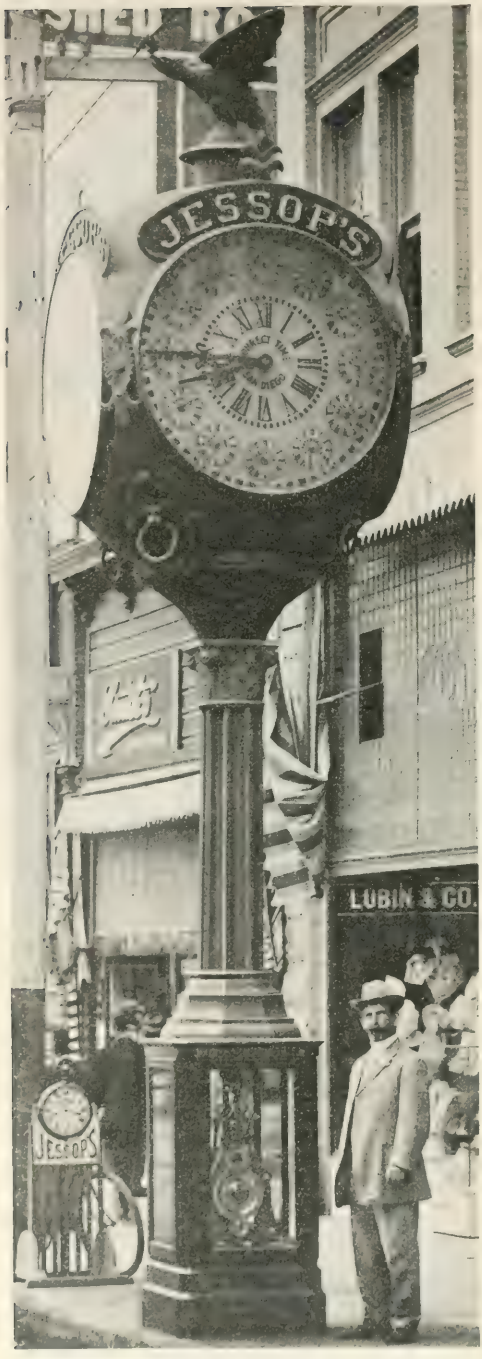
There exists a certain kind of plants, the so-called legumes—clover, peas, beans, alfalfa, etc., which are capable of assimilating the nitrogen of the air indirectly, that is, by means of germ clusters or nodules which they form on the roots. These nodules are created by certain bacteria and only where these nodules are present is nitrogen taken from the air. The refuse of these bacteria or germs is almost pure nitrogen. Hence, in plowing them under, we have the most effective and cheapest fertilizer imaginable.

After twelve years of extensive study, experiments and researches, Professor Hiltner of the German Agricultural Experiment Station, Munich, has succeeded in breeding these bacteria artificially so that they may be inoculated with the seed into the soil and the benefit of this fertilization realized.

EFFECT OF NITROGEN BACTERIA INOCULATION.
Plant on left was treated. Plant on the right was not. The result is clearly shown.

HOW THE ENGINE IS PLACED.
Remodeled life-boat makes a serviceable pleasure craft.

TILTING AT THE RING IN A MOTOR CAR.
How society at Leicester, England, has taken to amusing itself.



A Remarkable Clock.
Street timepiece that has sixteen dials, keeps the calendar, and has all its works open to view in a glass case. The maker claims that no other clock of the sort has ever been produced and certainly not by a retail jeweler.

SIXTEEN DIAL CLOCK

A TIME-KEEPER which is said to be unique in many respects stands in the business section of San Diego, and, although it is a huge street clock, it is built like a watch with tourmaline jeweled movement. The manufacturers state that this is only one of the points in which it differs from all other clocks of its class, the other unique points being that it is the first street post clock ever built with sixteen dials; the first of the sort ever made with visible works enclosed with plate glass; the only one of its kind that tells the month, the day of the week and date and, finally, the only clock of its class ever built in a retail jewelry store. This remarkable time-piece stands twenty-one feet high above the sidewalk, upheld by an ornamental iron column and surmounted by an eagle. Its sixteen dials tell the time in the following cities: New York, London and Liverpool, Paris, Berlin, St. Petersburg, Calcutta, Tokio, Hong Kong, Melbourne, City of Mexico, Milan, Cape Town and San Diego. The time of foreign towns is indicated in a circle of small dials surrounding the central dial, which records the local time. The clock is operated by a two hundred pound weight, and it winds automatically. It is equipped with chimes and illuminated by night and represents an investment of $3,000 and fifteen months of hard work on the part of Mr. J. Jessop, the inventor and manufacturer.

NORTHERN HOT SPRINGS

THAT ancient volcanoes had something to do with the lay-out of Western America is evident not only from the wonderful display of mountain scenery in the Rockies and minor ranges. Springs that send out hot water in unlessening volume and temperature indicate that there is still some lively action away down inside, and they occur not in one locality alone but at very considerable distances. The springs in Yellowstone Park and in the Canadian National Park at Banff are very well known. But at least three others have recently been found much further north, in a region that is usually associated with cold

rather than hot things. During the survey for the Grand Trunk Pacific Railway through the Yellowhead Pass a natural hot spring was discovered near Myette Peak, and the railway people have made note of the fact for the future use of their tourist department. Still further north, at Port Essington, are springs whose waters give good out-of-door bathing at 109 degrees. These have been reserved by the Canadian government. The third hot-water reservoir is almost on the edge of the Pacific Ocean, on the west coast of Vancouver Island. With immense quantities of coal, tar, gas, and oil underground, some of which, in the Mackenzie River district, has been on fire for years at a time, one need not be surprised if the bowels of the earth should be found to hold a reserve stock of hot water, which lets off from numerous faucets throughout the country.

HOT SPRINGS OF THE FAR NORTH.
Bathers at a spring at Port Essington, B. C., where the water comes up at a temperature of 109 degrees.

MONSTER SWORDFISH

THE swordfish seen in the accompanying photograph was recently caught in the Indian River, Florida. We get an idea of its length by comparing it with the two men and child standing one above the other against it. It measured eleven feet nine inches long and weighs about three hundred and ninety pounds.

With its formidable weapon the swordfish is a dangerous creature to tackle. There are on record many well authenticated instances wherein this pugnacious creature has driven its sword through the sides or bottoms of small boats, to the peril of the occupants. Broken swords have been found in the sides and bottoms of quite a number of ships. In the government museum at Singapore is a three-inch-thick section of copper-sheathed oak plank, cut from the side of a ship, which has sticking through it the sword of a swordfish. Now, the material of such a sword is by no means so hard that it could by ordinary means be forced through three inches of the hardest kind of oak planking, sheathed with copper. The fact of clean penetration implies a speed of not less than sixty miles per hour, and perhaps more, and the fish must attain this marvelous pace in attack.

MONSTER SWORDFISH.
Remarkable specimen of a [illegible] sea-dweller.

ROPE OF HUMAN HAIR

WHOEVER visits the great temples at Kioto will find there a most curious sight savoring somewhat of the Chamber of Horrors. Several hundred years ago when the temples were in process of construction, the Japanese women sacrificed their hair to make the huge ropes that were used to haul the heavy timbers up into position. There are twenty-nine such coils in all, each ninety feet long and nine inches in circumference. From the amount of hair contributed it will readily be seen that religious sentiment entered largely into the lives of these women of olden times. These ropes are highly prized and are guarded by the temple attendants day and night.

ROPE OF HUMAN HAIR.
Strange relic kept in a temple at Kioto, Japan.

QUEER INSECTS

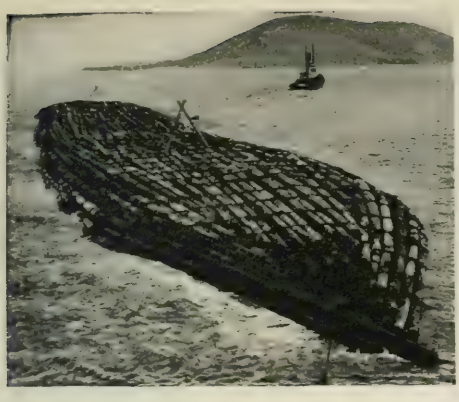
ONE of the attractions of the Children's Room at the Smithsonian Institution in Washington is a collection of the most remarkable insects in the world.

The collection includes a giant centipede, a huge scorpion, and a bird-catching spider—this last being one of those huge arachnids commonly known as tarantulas, which do not spin webs. Of course, neither spider nor scorpion is properly speaking an insect, but for popular purposes they "belong."

There is also a giant African beetle, as well as two or three great horned beetles of other species. The curious "seventeen-year locusts" are necessarily represented, and likewise the picturesque dragon flies.

Last but not least important are the "walking sticks" and "walking leaves," in which, because of their curious mimicry, the children are always greatly interested. The collection gives older people plenty of food for thought.

WORLD'S STRANGEST INSECTS.
Interesting exhibit in children's section of Smithsonian Institution.



HUGE RAFT OF LOGS.
One bunch containing 5,088,000 feet chained together for transportation.

A RECORD RAFT

WHAT is claimed to be the largest log raft ever constructed has recently been towed down the Pacific Coast from Oregon to San Diego, California. It contains enough lumber to represent one hundred acres of timber or in round numbers 5,088,000 feet.

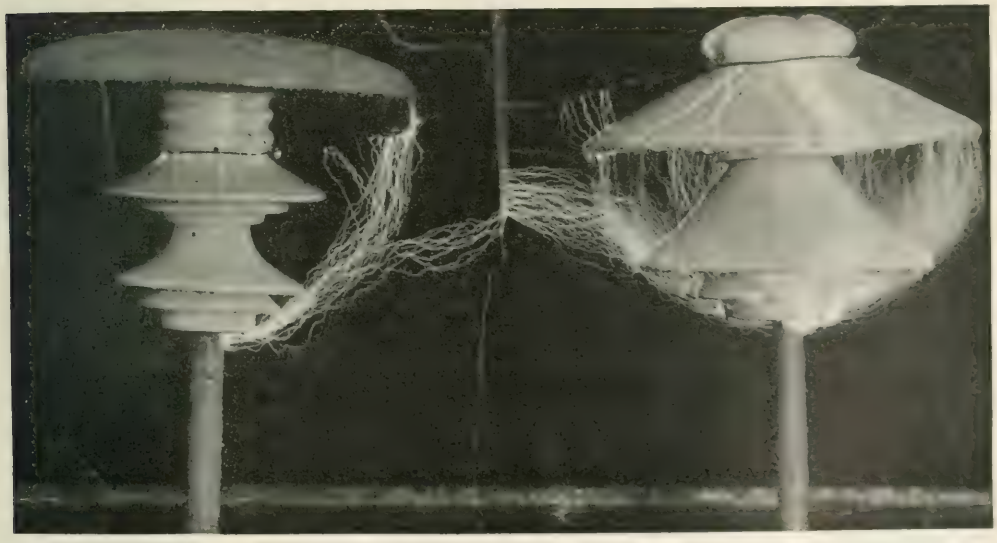
The length of this monster is eight hundred feet and it is fifty-two feet wide. The photograph shows only the smaller part of the immense mass of logs, as it stands out of the water thirteen feet, while twenty-five feet is submerged. The trip from Wallace Slough, Columbia River, Oregon, was made in fifteen days, the distance being approximately twelve hundred miles.

HIGH TENSION INSULATORS

THE question of insulation in supporting conductors on high tension power transmission lines is of the utmost importance and most exhaustive tests are made of the porcelain insulators employed for this purpose, the testing voltage usually varying from two to three times the pressure normally employed on the power circuit.

The tests are usually made under very severe conditions as nearly like those met with when the insulators are in service as possible. Artificial rain is produced with pressures varying from 70,000 to 150,000 volts or more applied for varying lengths of time according to the conditions and voltage of the transmission line on which the insulators are to be employed.

The accompanying illustration shows a test of Italian high tension insulators with the water pouring off from a protecting hood mounted on the top. These insulators are made of procelain of one, two, three or more pieces cemented together.



LEAKING HIGH TENSION INSULATORS.
How the current slips from supported wires when falling rain acts as a conductor

HEARING WITH THE TEETH

MANY deaf people are able to hear much better with the help of a fan than with an ear-trumpet. The fan, however, is of a special pattern, made of hard rubber. It is held between the teeth in such a way as to be bent toward the person who is talking. Thus it serves as a sort of sounding board, and the voice of the speaker, impinging upon it, is conveyed through the teeth to the auditory nerve of the person using the fan.

The tooth nerves are not connected directly, of course, with the auditory nerve; but there is an indirect and roundabout connection, which enables the user of the fan to hear literally through the teeth. It sometimes happens, however, that a person who has been accustomed to employ such an instrument loses his teeth, and the fan thereupon ceases to be serviceable.

HEARING WITH THE TEETH. One method of sound perception easily tested.

SMOKE STACKS AT FORTY FIVE DEGREES

WHAT is apparently a freak, but in reality is a clever piece of economical construction, is the system of smoke stacks lying on a hill at Bisbee, Arizona. Before the Bisbee smelter was removed to Douglas they served the big plant, though with the passing of the smelter their days of usefulness are over.

These unique smoke stacks consist of jointed iron pipes about eight feet in diameter which extend several hundred feet along the abrupt slope of a hill. They have an angle of about forty-five degrees and terminate at the upper end with a short upright section. The cheapness of this system of smoke stack construction compared to upright shafts is apparent at a glance, but it is only under exceptional conditions that it can be duplicated.

PROSTRATE SMOKE STACKS. Chimneys that lie on a hillside.

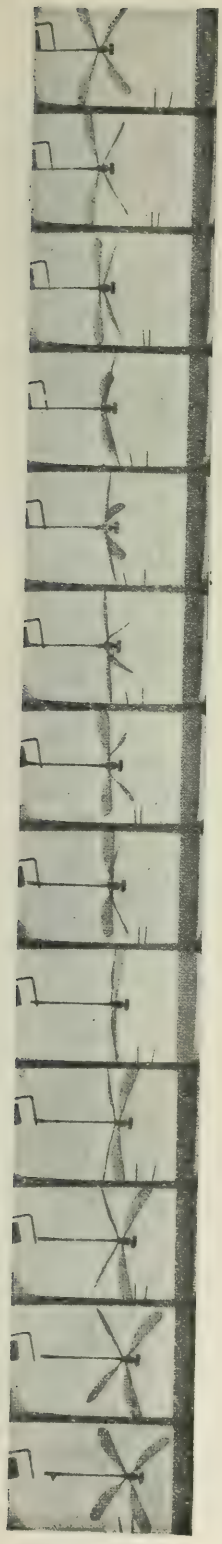
COCOANUT HAT AND RAIN-COAT

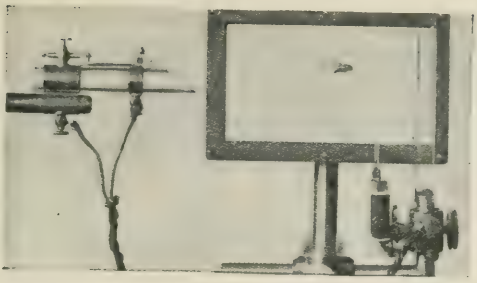
TO the inhabitant of the tropics the cocoanut stands in much the same relation that the up-to-date department store bears to the denizens of progressive American cities. It is a sort of universal provider. The meat of the cocoanut is an important article of food, and the milk is a refreshing and nourishing drink. The timber is useful in house building, and the leaves for thatching. The shells are employed as drinking vessels and utensils, and the fibers for making mats, clothing, cordage, brushes and a vast variety of useful articles.

Among the natives of the Philippine Islands, useful and serviceable raincoats are made of the inner fibers of the bark, and equally serviceable hats for all sorts of weather are plaited from portions of the leaves, split into suitable widths. Clad in these, our "fellow citizens" of the far East are able to bid defiance to even the drenching storms of the tropics.

The photograph reproduced herewith shows a Philippine girl in garb of cocoanut palm products, ready for a trip in the rain and feeling amply protected. She has a decided advantage over her sisters in silks.

NOVEL HAT AND COAT. Rain protectors made of products of cocoanut palm.



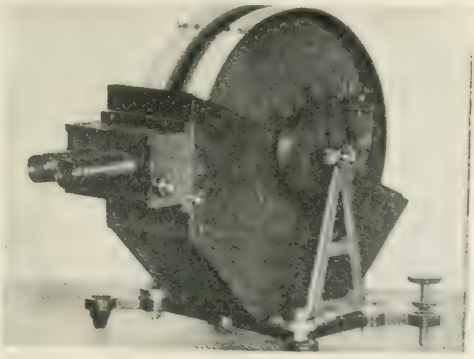


MOVING PICTURES OF INSECTS.
Actual flight of tiny fly before the camera.

ULTRA-RAPID CINEMATOGRAPH

THE most complicated scenes are now reproduced by the cinematograph. An apparatus has been invented by which can be obtained on a film, in a second, more than 2,000 perfectly clear, regularly spaced, stereoptic pictures. This apparatus is composed of a wheel which is of strong pasteboard and admits a film. On the axle of the wheel there is a rotary electric interrupter which can produce 2,000 interruptions in a second. Each one of these breaks is accompanied by an indirect spark which flashes and makes impressions upon the sensitive film. The movement of insects' wings is much too rapid to be analyzed directly. This machine easily photographs the movements.

For insects that hesitate before they take their flight, the subject is placed in a glass tube, partly closed by a very small thin door of mica, electrically connected. After having introduced the insect the operator waits for it to push out, raising the door of mica. When the insect flies the mica door falls back, and a current is established that starts the machine.



INSTRUMENT THAT TAKES 2,000 PICTURES TO THE SECOND
Specimens of its films are shown at the sides of this page.

JUST OUT.
Baby ostrich's first view of daylight.

RAISING OSTRICHES

THIRTY years ago the ostrich was known in the United States only by specimens in the zoological gardens or were occasionally seen in caravans accompanying a circus. Now ostrich farming is a flourishing industry in California and Arizona.

INCUBATING OSTRICHES.
New methods applied to hatching big birds.

Artificial incubation is employed on the farms, the incubator for ostrich eggs being constructed on the same principle as for hen's eggs. They usually produce from 90 to 100 per cent.

The ostrich flourishes in a region which is sheltered from the north and west winds, in a dry climate on rather sandy land which is as level as possible with a provision for pure water.

VICTIMS OF DISEASE.
Effects of strange contagious ailment that attacks unused coins.

DISEASES OF METALS

METALS, like living organisms, are subject to diseases which in time destroy and render them useless, and these diseases are transmitted by contact from one specimen to another.

Half a century ago the attention of scientists at Leipsic was called to some curious structural modifications of tin which had been observed in some old organ pipes. The German chemists attributed these changes to the sonorous vibrations to which the metal had been subjected. In 1861 Fritzsche, a chemist at St. Petersburg, made some interesting studies of blocks of tin which had become infected, also of a quantity of uniform buttons that had been stored in a war magazine which were changed into a pulverized mass. He decided that the disease was caused by the very low temperature in Russia during the winter of 1867-1868, and justified his opinion by convincing experiments.

During the past year M. Ernest Cohen has made extensive researches in this direction which have proved beyond doubt that a piece of diseased metal has the power of infecting a perfectly sound piece if in contact with it.

The photographs show a metal coined at Leyden about the end of the seventeen century. Some enormous gray wart-like blisters are developed on the face as well as the back of it. As the disease advances the blisters grow larger and the metal loses is luster and finally the mass crumbles. When the metal is in use, warmed from time to time to 20 degrees centigrade it will remain healthy.

FLOATING DOCK'S OCEAN TRIP

A HUGE floating dock, built for the Brazilian government by an English firm of shipbuilders was lately towed from Banon-in-Farvers by means of two large tugs. It is estimated that it will take about seventy days to reach Rio de Janeiro and that the cost of the tow will be about eighty thousand dollars. The floating dock has been constructed to lift the battleships built in England for Brazil.

HUGE FLOATING DOCK FOR BRAZIL.
English built structure on its way to new home.

COPPER FROM TIN CANS

IN Bisbee, Arizona, tin cans are at a premium, and all kinds of scrap iron can be turned to good use there, including old pipe, half rusted tin roofing, superannuated stoves and similar articles.

The operation is exceedingly simple and yet it utilizes the heavily copper laden waters of the Czar Shaft, which would otherwise go to waste with thousands of dollars worth of mineral in solution. By means of this precipitation plant the water is carried in a system of shallow troughs—something like an apparatus for cooling water for use in boilers—and tin cans and all kinds of junk are put into these troughs where the water can flow over them. Gradually the iron is covered with pure copper.

ELECTRICITY IN A GAS-LAMP

STRANGE as it sounds a gas lamp has recently been invented in Germany which uses those two hostile competitors, gas and electricity, for lighting, and in such a manner that each agent alone will not produce the desired lighting effect.

We all know that for burning any gas oxygen is necessary and this fact is responsible for the mantle-system in which the gas is distributed over a wide surface to mix thoroughly with air. The disadvantage, however, is that the necessary oxygen is taken by the flame instead of being supplied to it in great quantities and by outside help. This feature induced inventors to employ the so-called press-gas system in which the gas is compressed by mechanical force and on escaping draws sufficient quantities of oxygen to the flame. However, there are other drawbacks such as the expense for compressing the gas, machinery, extra strong pipes, wages for the men who run the machinery and the like.

Later on experiments were made to construct lamps which themselves furnish the theoretically necessary amount of air. Some employed very long chimneys, others a small heat motor with fan, but these devices were too delicate to withstand the great heat and failed to be used on a large scale.

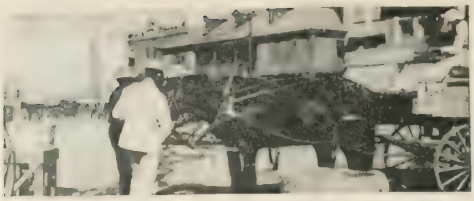
A German engineer, however, was busily engaged for the past few years to solve the problem in another way by using electricity and it is only a few weeks ago that he came out with a remarkable invention. The main feature of the latter is that electric energy is generated by means of a thermo-battery heated by the burnt gases and a small electro-motor is driven by the current to propel a fan which draws in the required amount of air. With reference to the illustration it is the thermo-battery, located above the mantle. It is composed of nickel, copper and aluminum which metals can stand a heat up to 1,200 degrees C., in this lamp they are subjected only to half of it. The usual materials for such batteries as zinc, antimony and bismuth are far too delicate for this great heat. An ordinary lamp gives about 1,250 candlepower at an expense of three cents an hour. The combination of gas and electricity attracts attention to this light.

ELECTRIC GAS-LAMP

LANDING FOR AEROPLANES.
English hospitality exemplified at Margate, where foreign air-craft are expected to make landings.

VIEW OF THE FLUME.
Place where copper is collected from mine waters.

WHERE COPPER IS TRAPPED.
Escaping metal is here saved by a simple device.



SANITARY DRINKING TROUGH.
Los Angeles furnishes new protection to its horses.

PROTECTING THE HORSES

IN order to check the spread of glanders and other contagious diseases to which horses are liable, the S. P. C. A. of Los Angeles, has replaced the unsanitary watering trough on the Plaza with white enameled tubs and buckets which are cleansed frequently. An attendant in white uniform is on hand to water the horses from buckets and to see that the receptacles are properly cleaned. The abandoned concrete trough is shown in the picture, and anyone who has paused to notice an old fashioned watering trough, lined with algae, inches deep with sediment and often with a scum of floating insects and street filth, will appreciate the advantage of the new system which gives the horse a drink of fresh water from a clean vessel.

ELECTRIC GOLD DREDGES

GOLD dredging machinery has been utilized in California and Alaska for the past decade and in many instances they are driven by electric power to special advantage. The accompanying illustrations show electric dredges in operation at Oroville, California.

This machine consists of a pontoon provided with a long well for a little over half of its length, in which is lowered a steel ladder, hinged at the upper end. This ladder carries the chain of digging buckets which are driven electrically. The buckets discharge the gravel into a revolving screen. To aid the separation, water at a high pressure is discharged into the screen.

WHERE ELECTRICITY MINES GOLD.
New device that makes mining easier and more certain.

HANDSOME CONCRETE FOUNTAIN.
Unusually artistic village public drinking place.

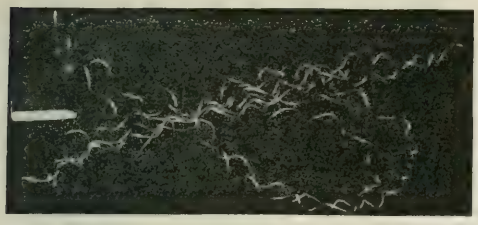
HANDSOME CONCRETE FOUNTAIN

AN interesting display of public spirit was recently shown by the citizens of the village of Park Ridge, Ill., a suburb of Chicago. Here in the center of the village a very beautiful and useful reinforced concrete fountain has been erected by public subscription, the entire work having been done by inhabitants of the village. As shown in the illustration, the fountain, which rests upon a mound, consists of a basin fourteen feet in diameter, from which arises a six-sided standard, supporting a beautiful curved fountain bowl six feet in diameter. From this bowl is to rise a jet of water some ten feet in height, which returning will fall upon the upper bowl of the ground basin in six broad streams. At the two ends of the mound are watering troughs.

MODERN GOLD DREDGE.
Machine that digs and washes out precious metal.

SUBSTITUTE FOR STEEL

ELWOOD HAYNES of Kokomo, Indiana, has discovered a new alloy which will work a large change in one part of the industrial world. By means of this alloy manufacturers can make cutlery without the use of iron or steel. This has never before been possible.



WORK OF A WONDERFUL NEW ALLOY.
Shavings taken from iron by cobalt-chromium.

Haynes is an automobile manufacturer but until fifteen years ago he was a chemist and now counts that his hobby. In his Kokomo laboratory Haynes has been working a long time on his experiments. At last he evolved the new alloy of cobalt and chromium. The alloy is unoxidizable. It retains its lustre under

TERRORS OF A TRAIN WRECK.
How the ordinary passenger coach is demolished in collision.

all atmosphere conditions. In cutlery the metal will take an edge comparable to good steel and is in many ways superior to steel so that it is likely to supersede the latter. The alloy takes a hard polish, very pleasing in appearance.

Pocket knives have already been made of it and with remarkable success. One bar was forged into a good razor which has been used hundreds of times. The newly-discovered metal can be made hard enough to turn iron on the lathe. Fruit knives made of it will not tarnish from contact with the juicy fruit.

GOATS LOWER INSURANCE RATE.
Where animals feeding keep down a fire danger.

Its cost is slightly greater than that of steel but in its practical utility it has a big advantage. No rust will gather on it under any conditions.

GOATS REDUCE INSURANCE

TO the casual observer, the connection between a flock of goats and the saving of money on fire insurance wouldn't be very clear, but that is the sole reason a big railroad contracting firm at Kansas City keeps a flock of Angoras. The yards of the company cover many acres of ground and besides the numerous buildings, several hundred thousand dollars' worth of equipment is kept in store there. When the yards were built the company applied for insurance, but the premium was almost prohibitive. The weeds, the underwriters said, greatly increased the fire risk on the property. They agreed that if the weeds were kept down the premium would be much more reasonable. So the company bought a flock of goats and turned them loose in the yards and they keep the yards mowed down like a lawn.

TELESCOPED PASSENGER CAR.
One of the results of old methods of construction in railroading.

Stream Finds Itself Again.
After underground flow, the Spanish Vero emerges to daylight.

MOUNTAIN TORRENTS OF UPPER ARAGON

SOME secrets of the physical geography of old Europe have lately been discovered by the explorer, M. Lucien Briet, who has penetrated the mysterious gorges of Mount Perdu, in part of Upper Aragon. The most interesting is his investigation of the upper basin of the River Vero with its five succeeding defiles. He has found halls, crypts, dark corners, small or spacious, which succeed each other, confused—all forming an arterial system—sometimes so dark that artificial light is required in order to find one's way. A natural bridge juts out above the chaos like a triumphal arch. The accompanying photographs represent the system of the upper basin of the River Vero and the valley of the Rodellar.

Sheer Walls of Rock.
Another view on the Vero's strange course.

In the Depths of a Canyon.
One of the picturesque places where the Vero flows.

Cave of a River's Making.
Excavation made by the river Vero, in the Spanish mountains.

PUTTING A PATCH ON A BALLOON.
How repairing is sometimes done on partially inflated monster when a leak is discovered as filling with gas is progressing.

POISON IN A BOOK

THE secrecy demanded in the business of supplying morphine to the victims of that deadly drug has stimulated ingenuity—as illustrated by the accompanying picture, which represents a book hollowed out for the purpose of serving as a box. It is big enough to hold half-a-dozen bottles of the poison.

MORPHINE PEDDLER'S OUTFIT.
Books are not always what they seem.

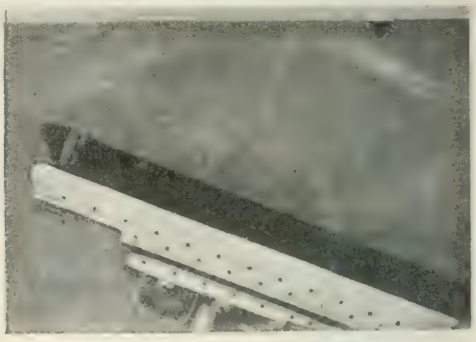
Such a receptacle, carried under the arm, would hardly be likely to excite suspicion. On the cover which lies open is pasted a memorandum of small quantities of the drug supplied to various "fiends" from day to day. Undoubtedly the business of peddling morphine at retail is highly profitable, and those engaged in it are not infrequently victims themselves.

The "fiends" are bound to have the drug, which becomes to them an absolute necessity, and, when they fail to obtain it by one expedient, they have resort to another. A woman victim has been known to get her morphine by persuading a friend to bring her a daily rose with the drug hidden among its petals—to the mystification of the sufferer's nurse and physician. Another woman, addicted to the habit, was supplied with the drug in a letter each day.

STONE TIGER

WORKMEN excavating in a street of Mexico City, struck a hard stone object that refused to budge under the repeated blows of their picks. An immense opening was dug, in the middle of which lay the partly overturned figure of the immense beast shown in the illustration. Derricks were brought into operation and at last the new discovery was hoisted to the street level. From there it was taken on rollers to the National Museum, where it now occupies a prominent place. Undoubtedly this hideous monster with its grinning jaws and bulging eyes was one of the deities of ancient times. This is attested by the fact that in the back there is an ornamented receptacle fully a foot and a half in diameter, within which were no doubt placed offerings of various sorts.

AZTEC SCULPTURE.
Stone tiger found in Mexico City.



BUOY INDICATING SUNKEN SHIP.
Ship overturned on the bottom, but buoy floats on the surface.

BUOY FOR SUNKEN SHIPS

AN Englishman has invented a buoy which automatically detaches itself from sinking ships, and rising to the surface of the water, indicates the place of disaster. The buoy is fastened to the vessel by a long rope, which is so arranged that it cannot become entangled when the ship is sinking, even if it overturns.

This buoy is of great importance to navigation, as with it sunken ships can easily be located for the purpose of raising them, and as a danger mark for other ships.

ARMORED AUTOMOBILE TO FIGHT AIRSHIPS

THE continued successes in the science of Aëronautics and their importance for a war in the future have resulted in the construction of a German weapon which may make harmless the newest means of aërial transportation. The

LAND BATTLESHIP TO FIGHT AIRSHIPS.

most modern weapon for a combat with aërial craft is the armor-clad automobile. It is fitted with a 60 horse-power gasoline engine and is able to take steep grades. The automobile carries a two-inch rapid-fire gun as armament. The weight of the complete vehicle, including gun, ammunition, outfit and five men is 7,350 pounds. The ammunition consists of 100 Bodenkammer shrapnels, each shrapnel containing besides the explosive charge 128 projectiles of hard lead. The double shrapnels are fitted with wings of babbit in which teeth are cut which revolve outward and are intended to tear the canvas of the balloon when hit. The automobile is covered with ⅛-inch nickel-steel armor. The gun is directed vertically and horizontally by the movement of a shoulder support which is handled by the gunner like a rifle. The greatest range is about 4¾ miles.

TURNS BICYCLE INTO AUTOCYCLE.
Motor wheel attached to cycle.

BICYCLE MOTOR ATTACHMENT

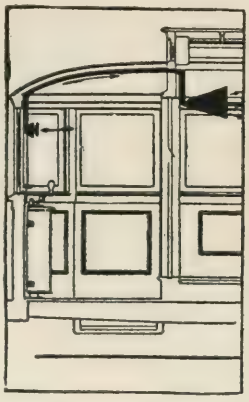
TO gladden the heart and relieve the limbs of the man who owns a bicycle comes a new power attachment which can be used on any machine. The device consists of a small auxiliary wheel twenty inches in diameter fitted with a light motor which is connected to the rear wheel of the bicycle. The motor is of the air-cooled, horizontal, two-stroke type and has a specially designed hub to which the power is transmitted through a six-to-one reducing gear.

All that is necessary to attach the wheel to the bicycle is to remove the nut on the chain side of the rear axle and bolt the machine on again with the same nut. The attachment requires only a few minutes. A single flexible wire extending to a small lever on the handle bars controls the motor. The wheel complete weighs only twenty-five pounds and is capable of driving the machine over ordinary roads at about sixteen miles per hour. Its maximum speed being eighteen miles per hour. The mud guard is so constructed that it serves the purpose of the gasoline tank, and holds enough fuel to carry the rider one hundred miles.

LUMBERING IN TEHAUNTEPEC.
Sawing a log of fine wood for the market.

SIMPLE STREET ANNOUNCER

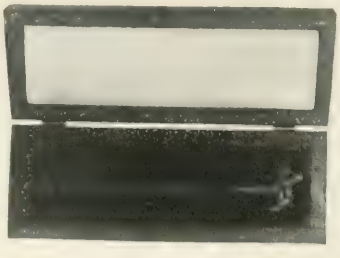
A SIMPLE device by which the motorman may announce the streets without leaving his controller has been devised by a street railway employee in Atchison, Kas. Directly in front of the motorman and above his eyes is fastened a mouthpiece from which runs a tube connected with a megaphone above the front door of the car. Words spoken in the natural tone of voice are slightly magnified, enough to be heard distinctly at the far end of the car. The conductor is left free to look after his passengers and the motorman can announce the street without taking his eye from the rail.



MEGAPHONE FOR MOTORMAN.
Tubing conducts sound into the car.

VALUABLE TACK HAMMER

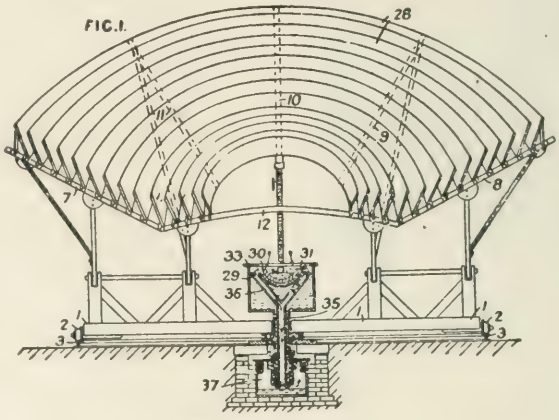
ONE of the most highly prized relics in Admiral Robley Evans' collection of curios is a souvenir that was presented to him on his visit to Santa Monica, California, on the occasion of the trip of the Atlantic fleet around the world. This relic, which consists of a gavel that was used by Admiral Nelson of the British Navy, was presented by the city of Santa Monica. It had been picked up years ago in a second hand store in London, and was used for years as a tack-hammer. While its shape was peculiar, nobody questioned but it was a hammer until one day an investigator scraped away the rust and found the engraved words which told the story. The engraving showed that the gavel had been a part of the equipment of the Admiral's flagship *Vittoria;* but it did not tell how the treasured souvenir had fallen into decay and finally found its place into a junk shop to be sold as a tack hammer while the tail of the royal lion was used as a nail puller.



NELSON'S GAVEL.
Used for years as a tack hammer

THE SOLAR SMELTER

AN apparatus known as the solar smelter has been erected outside Johannesburg, in South Africa, whose object is to smelt copper, tin, iron, etc., direct out of the ore by means of the heat from a reflector and, in the case of precious metals, even vaporizing them out of the gauge and condensing the vapor. The apparatus may also be used in the manufacture of calcium carbide and certain nitrates and in the distillation of oils. Curved mirrors of parabolic cross-section are mounted upon a frame comprising bars, rigidly connected together and to an underframe which is adapted to run upon the wheels around a circular track to allow for the apparent movement of the sun. The mirrors are preferably arranged concentrically or one behind the other and with their reflecting surfaces underneath so as to focus the sun's rays.



THE SOLAR SMELTER.
Sun's rays melt copper, iron, etc.

AUTO-AMBULANCE USED IN GERMAN ARMY.

BLACK MIDGET

PERHAPS the smallest woman in the wide world is Miss Wee Wee of Bryn Mawyr, Pa., aged nineteen, who is but nineteen inches in height and weighs but seven and a half pounds. She has four brothers and sisters, one of them being also a midget, but little larger than herself. Her mother was asked if there were any uncommon conditions attendant upon the midget's birth or rearing and she said she could think of none. As far as she knew, the midget was "just a happening." The tot is of colored extraction.

Although very tiny physically, "Princess Wee Wee" is very intelligent and exceptionally bright. She is something of a student and is a constant reader.

PRINCESS WEE WEE. AGE, 19 YEARS. HEIGHT, 19 INCHES. WEIGHT, 7¾ POUNDS.

SNAKE AND ITS VENOM

THIS interesting model represents the head of a rattlesnake—the skin and muscular tissue being removed in such a way as to exhibit the poison glands and the structures connected therewith.

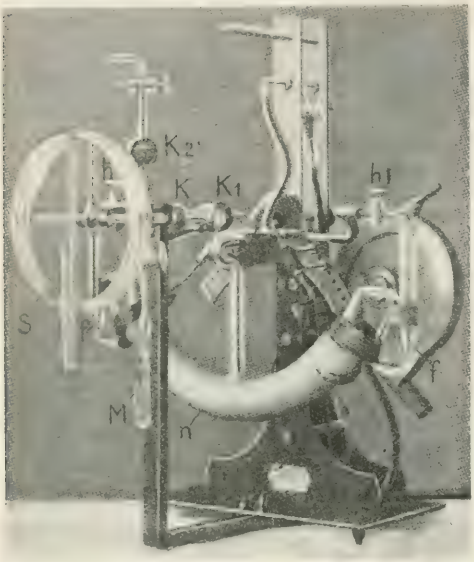
A SKATE SAILOR.

As will be noticed, there is a poison gland on either side of the head of the creature. It is connected by a special duct or tube with the base of the fang in front. Thus, when the snake bites, the poison is delivered from the gland (which is a bag of considerable size, and capable of secreting a large quantity of venom) to the piercing instrument, down which it travels through a channel provided for that purpose.

MODEL OF RATTLER'S HEAD.

PNEUMATIC MACHINE TESTS X-RAYS

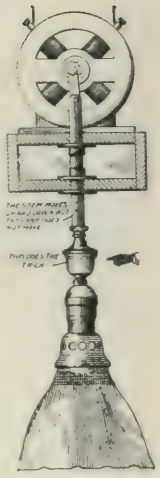
THE pneumatic machine is especially useful in the study of mysterious radiations such as the cathode, anode and the X-rays which are generated in vacuum tubes. The machine is a mercury tube which produces a vacuum caused by the regular oscillation of a column of mercury which acts very much like the piston of an ordinary pneumatic machine. After having produced a preliminary vacuum in the apparatus and



PNEUMATIC MACHINE FOR TESTING RAYS.

the vacuum tube the machine is given a permanent oscillating movement. The mercury remaining in the curved tubes acts as a force-pump, preventing the air from reentering, while the air from the vacuum tube is driven out by the mercury sometimes to the right and sometimes to the left.

The indicator of the vacuum is equally new and ingenious; it is shown at the left of the illustration. This consists of a glass spiral fastened to two crossed tubes; the one at the left contains a small quantity of mercury. The measure is obtained by turning the spiral on its axle from right to left, the small quantity of mercury enters the spiral, compressing the rarified air, until after several turns it reaches the curved tube. The rarified air in the spiral is compressed to one-thousandth of its original volume. In the right arm of the tube the mercury marks a lowering pressure. The atmospheric pressure in the rarifying inclosure is the one-thousandth of the pressure read on the indicator.



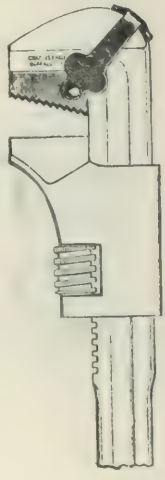
CLEVER TESTING MACHINE

WHILE the tungsten lamp is known to be highly efficient with satisfactory life when maintained in a vertical position and not receiving a shock or subject to vibration the filaments are quickly broken when the lamps are caused to tremble from the movement of machinery of various kinds.

The accompanying illustration shows a testing device for demonstrating the efficiency of one of the various types of shock absorber recently brought out to protect the metal filaments of tungsten lamps. An electric motor is provided with a vibrating mechanism, the stem moving up and down while the lamp remains stationary when the device for absorbing the vibration properly fulfills its office.

USEFUL DEVICE

A REMOVABLE attachment for transforming a machinist's nut wrench into a pipe wrench is shown in the accompanying illustration. The illustration shows the attachment in place, so placed quickly by a moderate pressure on the springlike loop, which extends around the wrench head on both sides and held securely by the pivot. These wrenches are especially serviceable in removing pneumatic tires from wheel rims.



Technical World Magazine

HENRY M. HYDE, Editor

Contents for January, 1911

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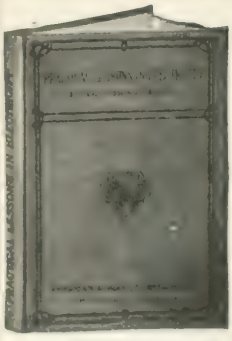

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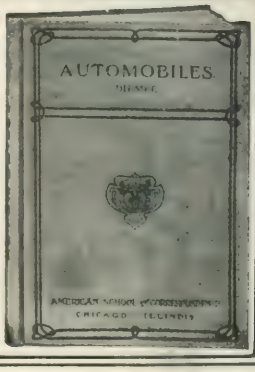

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January 1911.

"THERE WAS A REAL ROMANCE AND WONDERMENT ABOUT IT, AFTER ALL."
—*The First Plunge*, p. 520

THE TECHNICAL WORLD MAGAZINE

VOL. XIV JANUARY, 1911 NO. 5

HAUNTED HOUSES OF DEATH

By

F. C. WALSH, M. D.

Strangely enough, scientific investigation and discoveries are giving plausible ground to many of the superstitions of former days. Modern chemists have discovered many indications that all substances, in the last analysis, may have their basis in one common material, thus to a certain extent upholding the old theory of the alchemists that the baser metals could be transmuted into gold. Even our ancestors' belief in the existence of ghosts and haunted houses is in part upheld. But the ghosts are not the sort of the spectres that they were formerly imagined to be. In the past they were commonly believed to be nothing more than terrifying. Today scientists show us that there are ghosts of a different sort, which, though invisible, have form, and are far more dangerous to health and life than imaginary ghosts were ever dreamed to be.

FIRST thought sees no connection between haunted houses and the great white plague. But second thought knows there is some connection in many instances. And by the way, Mr. Man-of-Slow-Belief, is your house haunted? Are you sure that it isn't? You smile charitably, yet a smile is neither an answer nor an argument.

Back in the good old days, farther back than our grandmothers would care to remember, when "seeing ghosts" relieved the drag of time, and took the place of the moving-pictures of today; when vaudeville acts were woes unheard of, and society had its matinees and realistic drama in the form of witch-burnings, it was quite the proper thing to believe in ghosts and haunted houses. Then man had firm faith in supernatural evil agencies, and, to do him justice, he attacked those mysterious, intangible evils with all the strength of his manhood, to the full measure of his light and might. Our modern ghost is the tuberculosis germ, and its habitat, the haunted house, is too often your own home, Mr. Average-Citizen!

Some twenty years ago, as the writer remembers, in a certain Mid-Western town, three members of a family living in a sufficiently picturesque cottage, were stricken with consumption in rapid succession, and died. Nothing unusual about that! Nothing. But wait. The remnant of that family moved out, while another family, containing five children, moved in and within six months three members of this second family "went into a decline," as the mother stated, and ultimately died.

The neighbors were sufficiently observant to gossip over the similarity of death in the two families, and the wiser ones attributed the deaths to dampness, while the more superstitious openly hinted that the house was haunted. Time

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TWO "HAUNTED HOUSES OF DEATH."

The first is the so-called "haunted house" referred to in the article. It reaped its full harvest of death behind the pleasant line of the pine trees.

The second is an average modern "renting" house. This house claimed, in death from tuberculosis, no less than five victims, from successive occupants.

went on, and the house was sold. The purchaser, with a family, moved in, and in less than a year the old story of the haunted house repeated itself. One girl died. "Consumption," the doctor said. Two others of the family, young adults, were advised to change climate, and went to Colorado, with what result is unknown. This sadly decimated family, in its turn, moved away, and from then on, for some little time, the house remained vacant, a source of mystery to those inclined to superstition; a warning against "dampness" to others. Again

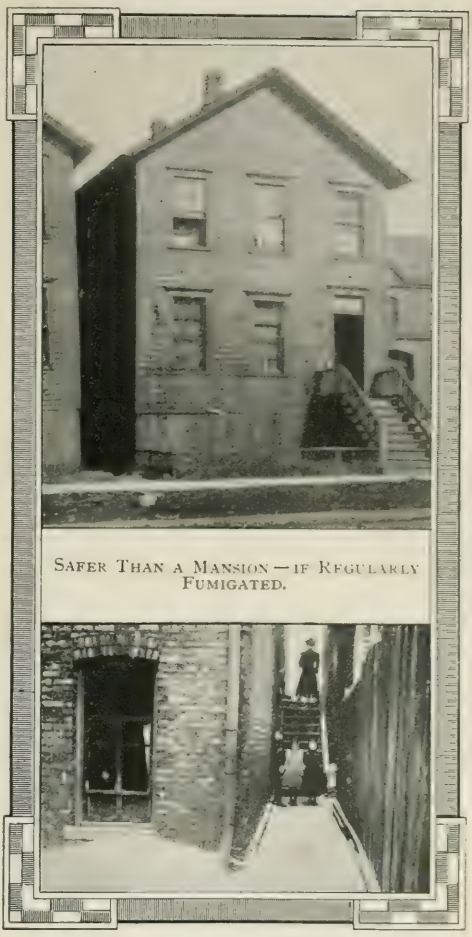
WHERE THE GAUNT SPECTRE LURKS.

This is a two-room home; the family consists of father and children, with an occasional boarder. There has been one death here, with two other cases.

Five members of a family of eight occupying two dark bedrooms and a kitchen. The boy is a paralytic due to tuberculosis in the family. The mother is an incipient case. The children are not robust.

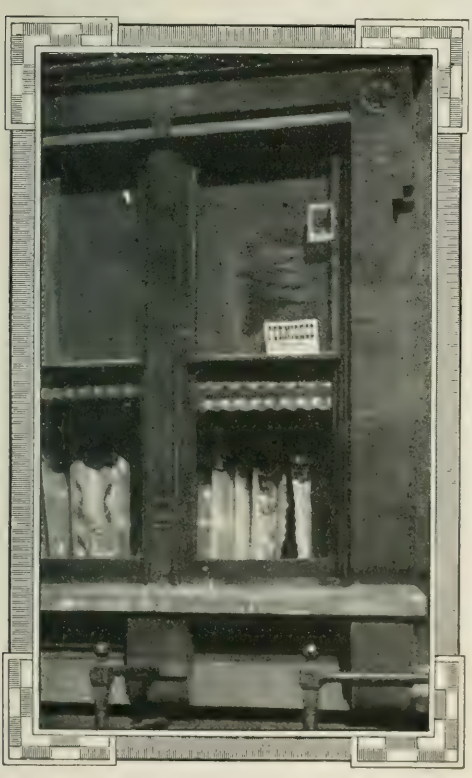
the house was put on sale, this time for a mere song, but no one wanted the whited sepulchre.

Then something happened. A young physician, new to the town, was making a professional call one day in the neighborhood. Before he left, his patient, a rather garrulous old Irishwoman, told him the story of the haunted house, with elaboration sufficient to make an interesting magazine story in itself. The doctor listened eagerly, and then made careful investigation for himself. He found no signs of dampness; found nothing, in fact, to explain the sequence of deaths. He then traced back for twelve years the different families who had occupied the house during that period. Finally he got back to the original owner and occupant, an old bachelor, who had died of lung trouble! The story was becoming interesting. Tracing down the various deaths from this beginning, our medical Sherlock Holmes found no less than twenty-five deaths from "lung trouble"



Safer Than a Mansion — if Regularly Fumigated.

Where Tuberculosis Holds High Carnival.
A rear basement, where lives a family of ten.



A Possible Death Trap — the "Furnished Room."
Unsafe under present insanitary conditions.

—tuberculosis—occurring in the successive families who had occupied the house up to the time of his investigation. Not one family that did not give up its quota to this horrible, intangible Juggernaut! His investigation completed satisfactorily to himself, the doctor bought the house.

It was a House of Death, and he knew it; but he knew also that his science could break the evil spell and turn it into a House of Life.

The average man will flee the wrath of one tarantula, or else attempt to destroy it, yet ten thousand tarantulas in every room of that evil dwelling would have been less dangerous to health and life than the malignant germs which, unseen by the naked eye, nevertheless

literally covered the walls and floor, particularly the latter. That abode of evil required just one thing to make it perfectly sanitary and safely habitable,—disinfection. And so it was fumigated and disinfected, as never a house was before. That was a number of years ago, when the neighbors marvelled at the doctor's madness. Today, they wonder at his wisdom, and the healthfulness of his happy family, who still occupy the house.

The above is a story, a true story, of conditions that exist today throughout the civilized world; only, the stories of the ninety-nine in a hundred do not have such happy endings. In your own neighborhood, Mr. Average-Citizen, especially if you live in a large city, are innumerable Houses of Death! And are you sure, after all, that you are not occupying one of them? Have you just moved into a house or flat? Who occupied it last? You don't know. Are you sure it wasn't some one afflicted with tuberculosis? If you're not sure, let us see what your chances are.

"The Sign of the White Plague."
The furnished housekeeping room is the worst offender against sanitation.

According to statistics, the chances are one in seven that it was somebody with tuberculosis. Can you afford to take that chance? Certainly not. Nevertheless, no matter how clean this flat or house which you are about to occupy may appear to be, the chances are one in seven that you are about to run the risk of contracting that greatest plague of modern times, tuberculosis!

We average Americans are a moving race, particularly in the large cities. Considering the semi-annual changes of May and October, is it any wonder that, under existing conditions, the number of white plague victims is largely on the increase, despite all our campaigning against it? Unfortunately, thus far, notwithstanding the amount of printer's ink, brains and money used, the campaigning has come to naught.

The reason for failure is plain. Taking as another instance the mere roomer—lodger, if you will—struggling for a bare livelihood all day, going home—he must call it home—at night,—to what? To a room, be it ever so cosy or humble, that may have been rented a dozen times to as many consumptives during the past twelve-month! The dusty carpet on the stairs; the conventional rugs in the rooms fairly reeking with malignant germ life; clean sheets, maybe; but blankets on the beds that may have been coughed into for a decade by an innocent victim of the disease, who innocently passes it on in turn to another helpless victim.

Imagine a child living under any of the conditions mentioned: inhaling an atmosphere laden with disease; crawling on all fours midst unseen filth and death. Its lungs may be attacked, or its spinal-column, causing "hunch-back" later, if it lives; or it develops hip-joint disease, making then and there a life-long cripple. The shame of it! And then we prattle and babble about heredity! No child was ever born with tuberculosis. The disease is always developed after birth, and is always due to exposure to a tuberculosis-laden atmosphere, and that atmosphere too often its own home.

Let credit be given where credit is due.

A CONSUMPTIVE DIED IN EACH OF THESE ADJACENT HOUSES.
The open windows represent the rooms where the victims passed away. No subsequent fumigation.

WHAT CHANCE HAVE HER CHILDREN?
Mother of two young children, who already has contracted the white plague. Family occupies two rooms.

Sunshine, living in the open air, sleeping with open windows, all are good. But sunshine, fresh air, anti-spitting ordinances, individual drinking cups, campaigns and funds for tuberculosis hospitals, all, thus far, will make for nothing. until one thing, the one vital thing, is done.

Then there is a silver lining to the cloud? Most assuredly. The beginning and the end of tuberculosis lies in what I have called the House of Death. "Ah,"

IN THE ROOM INDICATED BY THE OPEN WINDOW THREE PERSONS HAVE DIED OF CONSUMPTION.

say you, Mr. Average-Citizen, "I see what you are coming to. You would have every room and house that has ever been tenanted by a consumptive, fumigated." You have guessed half the remedy, The other half is to fumigate and disinfect every habitation, ever occupied by anybody, as soon as vacated, whether the occupant was consumptive or not. There is no use in mincing matters. When we are constantly menaced with so serious a disease, we can only be safe in considering every one guilty, until proved innocent.

Prevention, radical prevention, is our one salvation. Of what avail are expensive, special tuberculosis hospitals, while we are breeding victims in the House of Death faster than those same victims can die in the hospitals, to make room for a new army of stricken recruits. Let every nation, and every state, city and village, pass statutes and ordinances, causing every landlord to have and to show a clean bill of health for every room in his house, whether there has been illness therein or not. Then, before renting a house or room, every renter can demand to be shown a copy of such sanitary certificate, properly signed and dated. When this shall be done, you will then know, in so far as enforcement of law can go, that when you retire to your couch at night, if you and those in your safe-keeping will breathe and live in an atmosphere of health and purity.

A central bureau, established for the purpose mentioned, should have charge of disinfection and issuance of certificates, all of which will be an additional public expense in one way, but will in the long run save millions of dollars to the people, for the House of Death is an expensive one, as all disease is equally a problem of economics and sanitation.

In days gone by, it was sadly difficult for humanity to give up its belief in ghosts and haunted houses; today it is almost as difficult to get the people to believe in the facts of modern science. But let the propaganda of the general welfare be properly started, and soon every dweller in the House of Death, from Los Angeles to Buda-Pesth, from Archangel to El Paso, will break the spell, through systematic disinfection, of that ghost of evil, that pest of pests, the germ of tuberculosis.

NIAGARA'S RIVAL IN HARNESS

By

CARL CROW

WHEN American engineers began working on the Panama Canal, they looked about over the world's engineering achievements for examples of big jobs, which might aid them in their work. The search was almost useless. Before the Panama Canal many engineering feats had been considered big, but to the projectors of the biggest job in the world they were about as instructive as the working model of a tin locomotive would be to a man starting on the construction of a new Dreadnaught. Their quest led them finally to Mexico, where, in the roughest part of the rough Sierra Madre Mountains, they found the Necaxa power plant, big enough to command their respect.

They came and studied the blue prints and then clambered over dizzy heights to see a labyrinth of tunnels, dams and reservoirs, rivers diverted, towns moved to make way for canals, a power plant capable of producing 250,000 horse power and, leading over the hills, strands of big copper wire carrying the 60,000 volt current to Mexico City, ninety-six miles away, where it suffices to supply all the electric lights, run the street railway system, operate elevators, in fact furnish practically all the power in the city of half a million people. This demand for power does not begin to tax the resources of the big Necaxa plant and other lines lead many kilometers away to operate the heavy machinery of the mining camps at El Oro and Pachuca.

PART OF THE NECAXA FALLS POWER SYSTEM.
Outlet of water tunnel at the Tenango site.

At a distance of ninety-six miles to the northeast of Mexico City the comparatively level table land becomes broken and at an altitude of about 10,000 feet a jumbled mass of mountains marks the precipitous descent of the land toward the tropical sea level. Here you may descend the side of a huge mountain only to find at the bottom that you are looking over the top of other mountains which are higher. If local weather traditions were shattered here by a heavy fall of snow you might start from the edge of the cold table land on a toboggan slide which would carry you down the mountain side through little sheltered valleys, between the walls of deep canyons, and end only five thousand feet below, where your toboggan slide would melt under the tropical sun of the state of Vera Cruz. *That* suggests a considerable altitude.

Tumbling down these mountains and running through valleys so narrowly walled in that the sun strikes its waters only at midday is the Necaxa River. Fed by springs from the mountain-side it forms a good sized stream before it plunges over a precipice for a sheer fall of 460 feet, then runs a few hundred yards through a rocky bed to make another fall of 740 feet. At the headwaters of

THE GREAT DAM AND ITS PENSTOCKS, OR CONDUITS, FOR CONVEYING THE WATER TO THE TURBINES.
It is 184 feet high, 1300 feet wide, and capable of impounding 50,000,000 cubic yards of water.

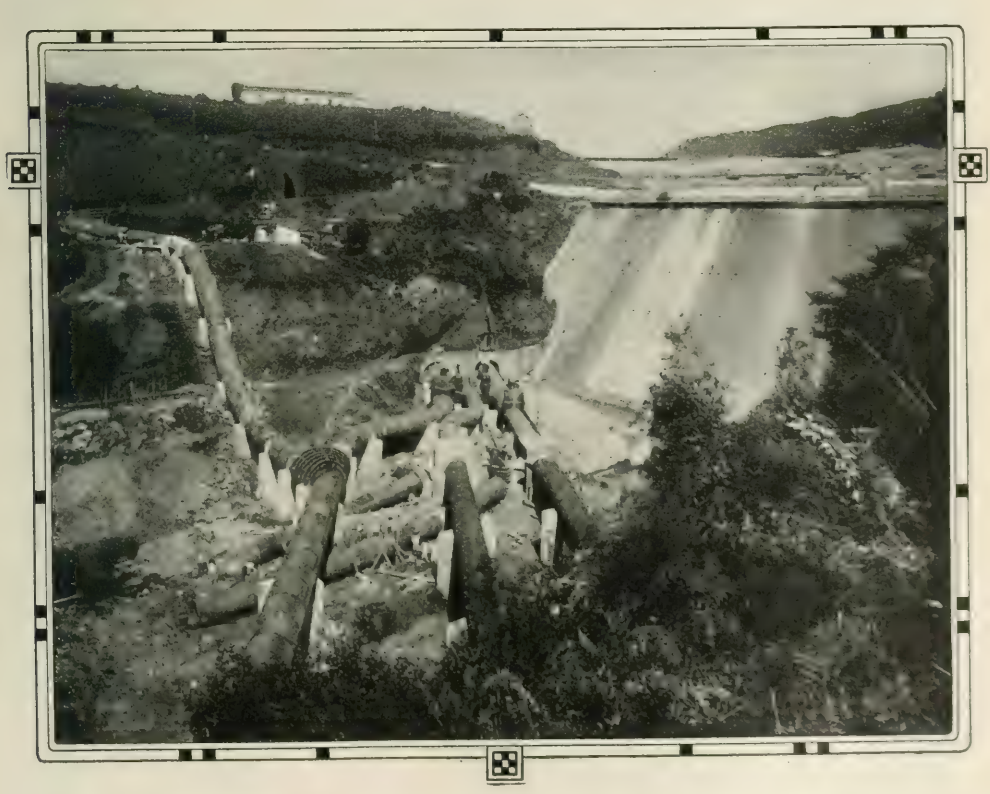
the river is the temperate climate one would find in Illinois but the descent is so rapid that a few miles below, he who follows the stream will find tropical fruits and orchids of rare value.

French soldiers who came to Mexico to aid the cause of Maximilian, sought in vain to find passage through the rugged country and those who survived returned to France with stories of the beauty of these falls which were unknown to Europeans. A half century later a French engineer conceived the idea of utilizing this hidden bit of scenery for a power plant. The idea was talked of, a company half formed, and then the project abandoned.

A little later the possibilities of a power plant here were suggested to Dr. Pearson, a New York financier who heads the Mexican Light and Power Company.

American engineers started to work on the plans and soon saw what probably had escaped the attention of the Frenchman, that the falls of Necaxa had once been much larger. The worn, flower-and-fern-covered cliffs, over which they tumble are wide enough to accommodate a flow of water many times larger than the present stream. Perhaps a few million years ago prehistoric races of Mexico were able to gaze on a pair of falls, either one of which was much larger than Niagara is now. Earthquakes and the action of volcanoes long since extinct contrived to crumble the earth's surface here and separate the original bed of the river into a dozen minor watersheds and as many small streams of water, all rushing in steep descent toward the sea.

Here it became the task of the American engineers to undo the work of nature, to demolish scenery, to remodel a set of mountains, to dry up old rivers and replace them with concrete canals and tunnels. Most of the work has been accomplished now, though several thousand peons are still tediously carrying drift and rock on their shoulders or in baskets sustained on their backs by a



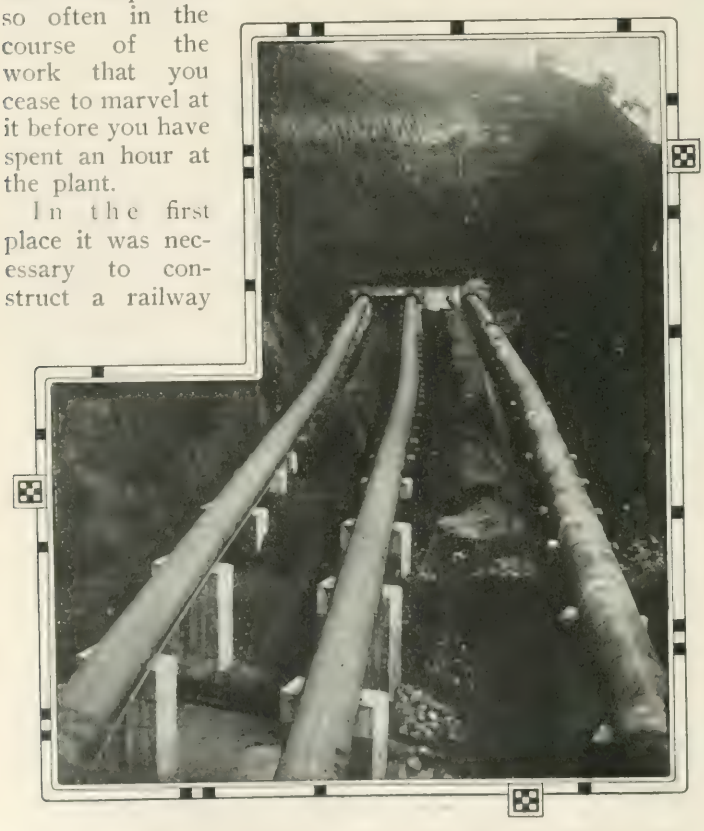
BEGINNINGS OF PENSTOCK AT ONE OF THE AUXILIARY DAMS.

strap over the forehead. One American contractor who was new to construction work in Mexico shipped in a carload of wheelbarrows and the peons obligingly tried to use them by carrying them on their heads, but that is another tale. The wheelbarrows went back to the States and the thousands of tons of dirt and rock shifted about in the Necaxa work have been moved in baskets. This is an improvement over some parts of the Republic where peons in similar work carry the dirt in gunny sack aprons.

In the accomplishment of this work it is to be doubted if the famed engineers of Panama have been called upon to solve any more perplexing problems. The project would not be an easy one with a level piece of ground on which to construct a power house and with railway lines and machine shops located conveniently. Here they had none of these advantages and the impossible has been accomplished so often in the course of the work that you cease to marvel at it before you have spent an hour at the plant.

In the first place it was necessary to construct a railway line from Carmen, the terminus of the Hidalgo road. This narrow gauge road, by pursuing a devious course through valleys marked by this frowning Sierra Madre Mountains managed to reach Carmen, but at that point it was thought further construction was impossible and the problem of transportation was turned over to the burros. Obviously it was impossible to transport huge dynamos, lathes and mile after mile of seven foot water pipe over the mountains on the backs of burros, despite the skill with which these animals are packed and the remarkable weights their sagging backs endure.

The construction of the Necaxa railway was begun and completed over twenty-eight kilometers of roadbed so crooked that coupling bars eight feet long are necessary to allow the cars to turn the sharp corners. On this line they will tell you of the careless fireman who while shoveling coal into the engine one day was startled at the sound of falling glass and looked to see that he had thrown a shovel full of coal into the headlight of the engine. I do not know that the story is true but after a trip on the cowcatcher of the engine—and we really caught a calf that day—I can testify to the fact that the average summer park scenic railway looks like a Harlem streetcar line in comparison. People from all over the world who want to build a crooked railroad come to look at this one, and then go home satisfied that their own job is an easy one. The road wanders along the edges of cliffs and over the spinal columns of razor back mountains so lean that a cigarette tossed to the right or the left would fall in a



THE GREAT PIPES THAT CONDUCT THE WATER FROM THE RESERVOIR TO THE POWER HOUSE.
These penstocks are six and seven feet in diameter.

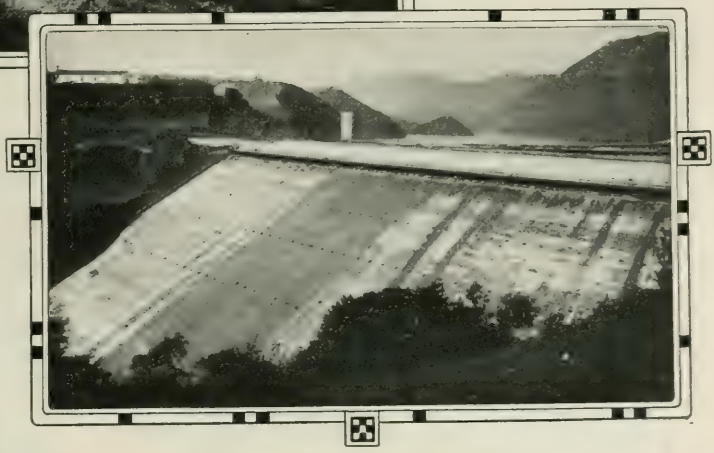
THE LOWER TOE OF A LESSER RESERVOIR, LOS REYES DAM.

stream a hundred feet below.

At the terminus of the road is Necaxa, a modern construction town built to replace an old Indian town which boasted historic ruins at the time Cortez conquered the Montezumas. At this point the big dam is built and the main reservoir of the system located. Promontories of two huge mountains approach each other here, enclosing a valley which some believe was once a huge natural lake. If it was, it existed many centuries ago for in it were many farms which the promoters of the Necaxa enterprise were compelled to buy from Indian owners who traced their titles back to the time they bought it from the Spanish conguistadores who had previously stolen it from their ancestors.

The town of Necaxa was bought and moved to higher ground and now all that remains to be seen of it is the tower of what is said to be a picturesque old Spanish church, replaced by one of modern concrete construction high on the hill. When the dam is finally completed this too will disappear under the higher level of the water.

The big dam forms the Necaxa reservoir, the biggest in the system and large enough to impound fifty million cubic yards of water. The other reservoirs, Tenango, Nexapa, Lagund and Los Reyes are smaller but altogether form a volume of water large enough to run the power plant through two years of continued drought. Tunnels through the mountains connect all of these reservoirs which lie in parallel valleys.

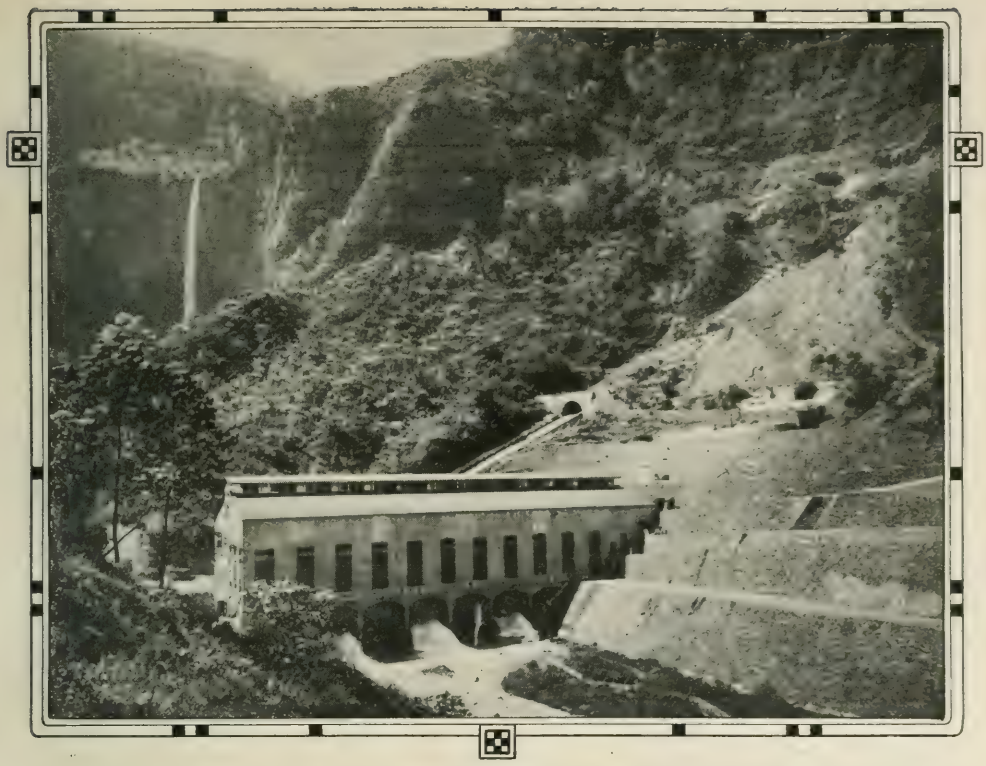


THE DOWNSTREAM FACE OF THE NECAXA DAM.

The Necaxa dam is 194 feet high, about 1300 feet wide at the river bed and contains almost two million cubic yards of material. The dam is built of stone and concrete as to both upper and lower toes and the center is composed of stone and clay sluiced in from the hills which rise high on each side. Two giant monitors, working night and day, fed by water from auxiliary reservoirs high up on the plateau, filled the center of the dam, and the water from the sluices drained back into the reservoir.

At this point the railway ends, for, resourceful as we are, no American engineer has as yet been able to construct a railway which will make a descent of 1400 feet in one mile. A quarter of a

PART OF THE TRANSMISSION LINES THAT CARRY THE CURRENT TO HALF A MILLION PEOPLE.



LOWER FALLS AND POWER HOUSE OF THE NECAXA SYSTEM.

mile below the big dam is the first Necaxa fall, or rather the precipice over which the water formerly fell, for so well have the engineers secured every possible drop of water that only a little stream trickles over and disappears into the vapor before it reaches the old river bed 460 feet below. A short distance from the first fall is the second fall, 740 feet high and below it is the power house, 1400 feet lower than the water level in the reservoir. Over the edge of these two falls all the machinery used in the power house has been lowered by means of a pair of elevators, strong enough to lower a locomotive engine without straining the machinery. Visitors to the power house are now taken down on these elevators and nearsighted ones are unable, when near the bottom, to see the upper end of the cable which appears to vanish into the air, like the magic rope up which the Indian jugglers climb into the sky.

A more rapid means of locomotion has been provided by means of a tunnel, which penetrates the mountain at an angle of about forty-five degrees and through which a passenger car thirty inches shallow is pulled on the end of a cable. By lying on your stomach at the bottom of the car the trip can be made in safety and comparative comfort, though care should be taken that the man who is piled on top of you disposes of his angles in a manner best suited to your own comfort.

Over the old bed of the river the power house has been constructed with as much care to detail and appearance as if it were a New York showplace instead of an enterprise located so far from the track of tourists that the names of the visitors of a year can be recorded in a very thin book. The power units, I am told, are the largest ever made and new records are being set in the construction of additional machinery. Water is carried to the turbines by means of pipes which pierce the mountain, bringing to each turbine a stream of water six feet in diameter and carrying all the force of

a drop of 1,400 feet. The power is developed at a voltage of 4,000 which is raised to the line pressure of 60,000 volts by means of five banks of 2,000 kilowatt single phase transformers. This current with the voltage of a playful bolt of lightning is carried to the Valley of Mexico over wires strung on steel towers. Inside the valley of Nonoalco the voltage is reduced to 20,000 and again to 3,000 for distribution around the city in underground conduits.

As has been true of many other large power projects, the demand for power from this plant has grown as fast as the plant could be enlarged. The construction has occupied seven very busy years and is not yet completed, though enough power is now being developed to supply all the needs of a population of more than half a million. At first it was planned to develop 50,000 horse-power but it was soon seen that this would be inadequate. Before the original powerhouse was completed it was necessary to change the plans and provide for one much larger than was originally intended. Now it provides for 250,000 horse-power, and crafty engineers have a plan whereby the capacity may be duplicated by the establishment of another power plant down the mountain side where water which has once turned the turbine will be made to do so again.

As an economic achievement for Mexico the project has accomplished wonderful results. It has cut the price of power in two several times until now electric lights are no longer a luxury in Mexico but an every night convenience. Electric power there is now so low that it competes with human power in the land where human labor is cheaper than any other place in the world. It has made possible the establishment of many manufacturing enterprises and developed a spirit of home industry in a city which has been accustomed to buying all of its manufactured goods from Europe and America. Without it these factories would be an impossibility, for coal in

POWER HOUSE AT NECAXA, SHOWING THE BIG ELECTRIC GENERATORS.

PERMANENT DWELLINGS THAT HAVE SPRUNG UP IN THE TOWN OF NECAXA.

Mexico costs twice as much as in the States.

The Necaxa Power Plant has, in the city of Mexico, displaced three companies which had previously been operating with electricity produced by coal. The equipment of these companies was acquired, at the same time, by purchase.

The Necaxa Company has peculiar commercial advantages. It is in control of one of the best available water supplies for power in the world. It has a franchise, in perpetuity, from the Mexican government. Also, it has received contracts for all branches of its service for long periods of time. Lastly, it is exempt from the payment of duties on imported supplies.

Love

All love at first, like generous wine,
Ferments and frets until 't is fine;
For when 't is settled on the lee
And from the impurer matter free,
Becomes the richer, still the older
And proves the pleasanter the colder.
As at the approach of winter, all
The leaves of great trees used to fall,
And leave them naked, to engage
With storms and tempests when they rage,
While humbler plants are found to wear
Their fresh green liveries all the year;
So when their glorious season's gone
With great men and hard times come on,
The greatest calamities oppress
The greatest still and spare the less.

—Samuel Butler.

CUTTING DOWN THE COAL BILL

By

HARRY CHASE BREARLEY

A WAGON load of Black Magic rumbles slowly along and unimaginative passers-by do not even turn their heads. They would see in it merely a load of coal as if that lessened the wonder of the fact that each lump contains a force potent enough, if released, to raise its weight a sheer two thousand miles above the earth's surface against the pull of gravitation. Or to put it in another way, a lump of one pound, smaller than a man's fist, would equal the full day's work of a heavy draught horse, or would do as much work in one minute as could twenty-six hundred strong men, or would move a heavy train of eight cars, including sleepers a distance of 880 feet.

Even as it is, the trolley cars are whizzing past with their tons of human freight, and, tracing back the power which propels them, it is found at last in the lumps of coal burning beneath the boilers of the power-house. The electric lights begin to twinkle and each succes-

SAMPLES OF COAL GOING THROUGH VARIOUS PROCESSES IN THE ANALYSIS.
In the three beakers, at which the man is standing, tests are being run for chemical constituents. In the crucibles to the left, ash contents are being determined.

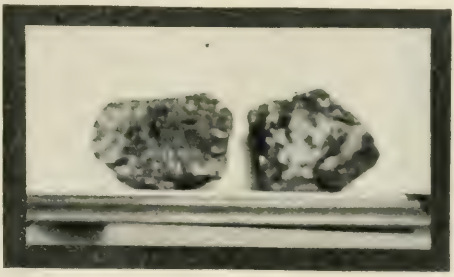
ASHES REMAINING AFTER LUMPS OF COAL HAVE BEEN COMPLETELY BURNED.
These piles correspond to lumps in illustration below, one producing three times the amount of ash of the other.

sive globe or bulb tells its individual tale of similar lumps. So do the gas lights, although the process is dissimilar, while the heat of the radiators and the speed of the elevators lie also in that wagon-load.

Nor is this half the story. The dinner anticipated by each of the busy passers-by is now cooking upon stoves which feed from such a wagon, their clothes were woven upon power-looms dependent upon it. The very coins in their pocket through it were smelted and stamped. While by far the greater part of all the objects about them were made possible by it. It is hardly too much, therefore, to say that comfort, prosperity, material civilization, and, in a sense, life itself are locked up within that wagon-load, as witness the public dismay which attended the progress of the great coal strike.

But now comes a curious fact. This substance of infinite importance, affecting the daily life of every man, woman and child in the United States, is bought with less intelligence by its consumers than is almost any other commodity of commerce. Can a man be imagined buying stocks without inquiring what the stocks represent, or a housekeeper ordering a basketful of groceries and not seeking to learn the contents of the basket? Yet something rather like this takes place when the average buyer exchanges his cash for a ton of coal. Coal is coal, he thinks—and sometimes it isn't!

Ten or twelve years ago the government commenced to investigate facts which had long been known to science and soon dry chemical formulas, translated into the popular language of dollars and cents, took on new life and interest. The government accordingly ceased buying coal as coal and began to buy it as heat. Next some concerns in Baltimore followed suit and from these the idea spread to certain large consumers in New York, Chicago and other cities. But ideas spread slowly against human inertia. Chicago has indeed applied it to a large proportion of her plants, but other cities are more



TWO LUMPS OF EGG COAL.
Each weighs about a pound. Both were taken from the same pile.

backward and the individual householder has not in general even heard of such a thing. Buying coal as heat, means buying coal upon analysis which is an utterly foreign thought to ninety-nine out of a hundred citizens, and yet it probably wants but popular education upon the subject for public opinion to bring about "pure fuel" legislation as was recently the case in the "pure food" law.

But to return to the wagon and its contents—the average buyer, hoping that the dealer may not have shortened the weight more than the anticipated eight or ten per cent, pays his bill with characteristic meekness. He realizes that much of the bulk and weight which go into his fire come away again in the shape of ashes and clinkers, but this occasions no surprise. It also was anticipated. It needs must be. However, commercial science now steps in with a contradiction of this statement. It does not need to be in any such proportions as have hitherto obtained, unless the buyer pays the lower price of an inferior grade. How is he to discriminate? Not by the appearance for even an expert can judge very little by eye alone. Here are two specimens of common anthracite differing little in looks, and yet one of them contains forty-one per cent of ash and the other but nine per cent—to state an extreme case. In other words the latter contains 1820 pounds of combustible fuel to every ton and the former but 1180 pounds. Here then are two grades sold at the same price, looking substantially alike, yet one of them exceeding the other in full value by more than fifty per cent. Furthermore the poorer coal produces four and one-half times the bulk in ashes of the better, meaning corresponding trouble and expense in handling, together with greater wear upon the fire-grate and a more frequent stoking of the fire. To say that a consumer must pay the same price for both grades seems almost as absurd as for him to pay a uniform price per acre for land without reference to its location or character, and yet while the example cited is extreme, it and its lesser variations are the every day facts of the coal trade. How then is he to discriminate? By scientific tests. Samples are taken from various parts of the coal pile, heaped together, mixed and "quartered," i. e., separated into four divisions by a shovel drawn in one direction and then a cross direction. One of these quarters is again mixed and again quartered until a small but representative sample of the entire pile is secured, which is thereupon thoroughly pulverized.

In this condition a quart jar full of black flour which may stand for many tons of coal, passes beneath the determining fingers of science. First a carefully measured portion is placed in a small crucible over a powerful Bunsen flame and is speedily reduced to a pinch of ash, pearl gray, golden brown, canary yellow, terra cotta or any of the delicate inter shades which speak to the experienced eye of the varying conditions attending the evolution of coal beds from the vegetation of an infinitely remote epoch.

The ash-content thus determined in quantity and character, it is carefully tabulated, indexed and filed away in a cabinet for future comparison with other coal from the same source. Meanwhile the calorimeter comes into use. It is not sufficient to learn the degree of incombustible material or ash for the positive heating ability of the combustible portion is a still more vital point, together with the detection of sulphur or other impurities.

These two facts made matters of record the secret of the coal pile is read, no very complicated matter scientifically considered, although one requiring experience, equipment and exquisite care, for a small error multiplied by tons soon becomes a serious matter.

It is, of course, inevitable that there should be a certain percentage of ash due to the conditions existing in the formation of the coal beds. It is also to be expected that this percentage should vary materially in different veins, but it is highly illogical and absurdly bad business for the consumer to pay as much for the poor grade as for the choice. Coal is to-day as already stated, part of the production cost not only of food, heat, light and transportation, but also of most manufactured articles. Cheaper coal means cheaper living at a hundred points. The difference between a successful and an unsuccessful business may

THE LUMP OF COAL HAVING BEEN PULVERIZED, SAMPLES ARE NOW BEING WEIGHED WITH GREAT CARE FOR ANALYSIS.

often lie in the coal bill and a manufacturer who has studied the problems of labor, of improved machinery, office systems, etc., often partially realizes this to the extent of experimenting with various combustion devices, without attacking the still more vital question of the coal itself.

Mr. W. S. Gould of New York, a leading authority on the subject, in conversation with the writer cited the instance of one large plant which decided to secure a laboratory test of its fuel and discovered that it ran as high as forty-one per cent of incombustibles. Complaint was made to the dealer who repeated the complaint to the mine operator and the result was seen in the next shipment tested, the proportion of ash being reduced to fifteen per cent, at which point it has been kept by frequent tests ever since. As the plant in question consumes about 70,000 tons a year such a saving of twenty-six per cent in fuel value has been equal to a total of 18,200 tons, which at $2.50 a ton would amount to $45,000!

A saving of $45,000 in a single year in a single commodity is hardly negligible in any plant. The delinquency in this case was an exceptional one but it is claimed that any consumer should be able to save at least ten per cent on the commercial run of coal when purchased upon the heat basis.

The need for such remedy is partly chargeable to that carelessness on the part of the operator and dealer, which the unsuspecting credulity of the purchaser is apt to encourage, and partly to a deliberate purpose to take an extra profit. Coal men not uncommonly work in from ten per cent to twenty per cent of slate and one of them naively entered the claim that fourteen per cent was allowable. Had his customer paid fourteen per cent of the coal bill with counterfeit money his view of privilege might have changed, for slate is not an inherent part of coal ash and may be mechanically sep-

arated at the mine. Moreover, it clogs the combustion and causes clinkers which often contain large lumps of unconsumed carbon at their centres. Occasionally there are submitted great, gray clinkers resembling pig iron which upon being broken open prove to be little more than unburned coal covered with a hard glaze from improper combustion. Such trickery therefore results in a much greater loss of heat to the consumer than merely the proportion of adulterant, to say nothing of the harmful effect upon the furnace, and the added labor of stoking and ash handling. With scientific scrutiny of the fuel purchases it is probable that the coal trade would be inspired with the conception of honesty as the best policy quite as strikingly as have the food packers since recent legislation upon the subject.

In many instances too, their own more immediate interests would be conserved for they are by no means to be classed sweepingly as dishonest. One recent incident will illustrate. A dealer supplied upon strict specification a certain coal which had an exceptional reputation for heating quality and freedom from sulphur. Almost immediately the plant discovered such difficulties in its fires that a sample was sent for laboratory test and found to contain an unusual percentage of sulphur. Investigation showed that the mine had unknowingly run into a vein carrying this excess of sulphur, obviously a desirable fact for the operator of a high-grade mine, with its reputation at stake to learn of. In another case a test proved that inferior coal had unwittingly been substituted for another famous product and again a reputation was saved through prompt knowledge. In both of these cases visual inspection was valueless since it is a proved fact that rusty, unprepossessing lumps may—or may not, as the case may be—contain a higher value than the shining jewel-like pieces of other runs.

All of the foregoing refers, of course, more especially to the larger consumers, for the average house-holder with his purchases of from five to twenty-five tons per year could hardly afford the relative expense of frequent tests. And yet there is no more reason ethically considered, why he should be compelled to pay a high price for an impure commodity than in the case of the plants. The remedy must come, as most remedies do, through education, popular demand, the joint action of communities and perhaps ultimate legislation, unless the coal trade is wise enough to render such action unnecessary by complying in advance with a clear public right—the right to know what it is buying. In other words, as a newspaper recently said, it should be made "a finable offence to sell coal without an analysis label or with a false one."

Kubla Khan

A damsel with a dulcimer
  In a vision once I saw;
It was an Abyssinian maid
And on her dulcimer she played,
  Singing of Mount Abora.
Could I revive within me
  Her symphony and song
To such deep delight 't would win me,
  That with music loud and long
I would build that dome in air—

—COLERIDGE.

BRINGING THE DEAD TO LIFE

By

FREDERIC BLOUNT WARREN

TO you who have lived in a day when wireless leaped trackless oceans and made continents talk with each other as men talk across a table; who have heard aeroplanes clatter out of misty obscurity and become appliances of human flight—to everyone possessing imagination and grasping the scope of man's present-day triumphs there will still be surprise in learning that human genius has wrested a secret from Death; *the* secret of restoring life to dead bodies; of calling man back from the dead.

Actually, this is no blow at centuries-old beliefs; one may continue to accept the Psalmist's measure for the length of the life-thread and still admit that there are thousands upon thousands of premature deaths — needless deaths; deaths by poison and accident; termination of life as unnecessary as the appalling slaughter of 200,000 infants each year that our better knowledge of hygiene is now doing much to counteract.

A RABBIT PUT TO SLEEP BY ELECTRICITY.
The reverse of Dr. Louise G. Robinovitch's discovery.

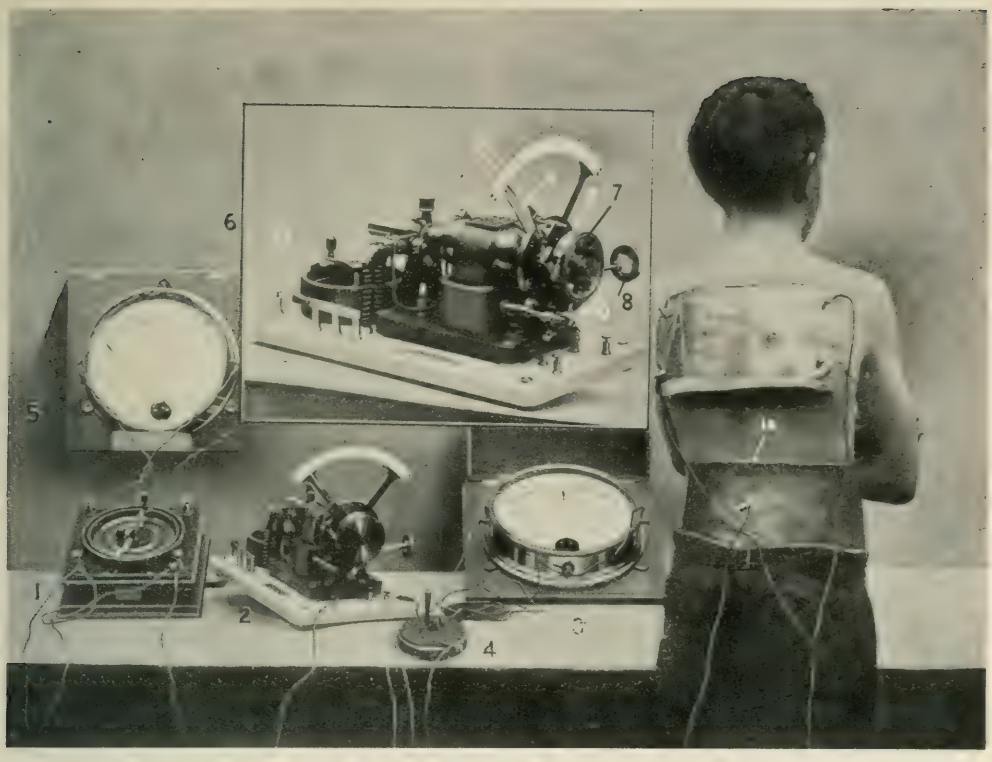
But for the countless victims of drowning, electrocution, chloroform, morphine, asphyxiation and scores of other causes of death—everything except broken down, worn out, years-old human machinery—a woman surgeon and scientist, famous on two continents, has found and demonstrated a life-restoring force in electricity.

One day more than a decade ago there sat in a little laboratory in Paris a young woman physician, who, for more than an hour, noted closely the effect of galvanic action upon the leg of a frog. Whenever she applied an electric current muscular contractions took place in the leg and therein the investigator found a principle which she thought might be applied to the human system. The heart and lungs in the human species, as well as in the animal, are formed of muscles susceptible to reaction from outside influences, she reasoned, and straightway began to experiment with various sorts of electrical apparatus. Applied to the heart of an animal, electricity, she found, made it contract and relax just as if she had taken the organ in her hand and squeezed it into activity. The lungs, too, proved susceptible to her electric excitations. From these scant bits of basic knowledge there were evolved electric instruments, which, if successful in fulfilling their purpose, would startle scientist and layman the world over.

Too often we Americans, in our faulty manner of conducting analyses, take almost no account of the personal equation and in the case of this young scientist, Doctor Louise G. Robinovitch, it is most necessary that we do so. Here, at the beginning of her tests, was a young woman of a long line of distinguished Slavic ancestry; still young, enthusiastic and full of characteristic nervousness to be found in all persons possessed of a great idea. And how revolutionary was the idea! If she were able, eventually, to demonstrate that the breath of life could be induced to re-enter a human body from which it had departed she foresaw the scoffing derision to which she would be subjected—even though successful. Persons welded to their religious beliefs by superstitions and teachings of centuries would seek to discredit her. It is not such a far cry back to the days when witches were burned in Salem, where liberty of thought was an irony; it is even within the present year that "witches" have been tortured in her native Russian land. And if she failed? It would invite the mockery of her own profession and the modern historians would add one more chapter to the story of charlatanry.

For two years these early experiments in Paris were partial failures, but there was always enough promise of ultimate triumph to lead the zealous fact-seeker onward. The chief source of trouble was to determine the exact number diameter of wire to be used in conveying an electric current to an animal body. Were the wire too small the animals died. Were it of too great diameter efforts to restore life were futile. At last she found the required thickness and cats and dogs dead for ten—twenty—thirty minutes regained their muscular and organic faculties, played about the laboratory when removed from the operating table and lived indefinitely thereafter—weeks, months or years. The appliance with which she worked was a box-like affair, with one set of wires leading to an electrode to be applied to the head or back of a subject, just over the heart and lungs. Another set of wires led to an electrode to be placed at the base of the spine. There was a switch with which to create the electric excitations, just such a switch as you have seen in a little motorboat; a positive slot on one side, a negative on the other and a little lever, or switch, hinged at the bottom, equi-distant between the two. Rhythmic excitations created by the switch, be it understood, are nothing more than alternate electric shocks of the cardiac and respiratory organs corresponding to the spontaneous beat of the heart and action of the lungs.

From this childishly simple device there emanated a life-force that restored several hundred animals; electricity which humanitarians had substituted for the hangman's noose for the taking of life had been converted into an agency to bring back life. Still, with the years passing rapidly, the greatest test remained unmade. In Europe not more than five men knew of these experi-



ELECTRIC MACHINE AS USED BY DR. ROBINOVITCH TO RESUSCITATE THE APPARENTLY DEAD.

ments; in America there were none whatever.

Then, one day in December, 1908, Paris found itself enjoying all the thrills of a great "story"—a wondrous tale that the flock of American newspaper correspondents there have never told to this day; a woman, dead and given up by the doctors in attendance, had been brought back to life.

"Doctor Volt!" exclaimed the volatile Frenchmen. Thus they dubbed the new development of the related science of electric anaesthesia and as "Doctor Volt" it is known today and will live in the future.

The woman was only one of the many characters of her kind in the underworld —a morphine eater—and she had been admitted to the Ste.-Anne Asylum, Dr. Magnan's service. For two years she had indulged each day in two grams of the drug. When admitted to the hospital she was deprived of this dose. Waiting to be examined by Dr. Magnan, she had a sudden attack of syncope. Various means were used to revive her and she regained consciousness. In a few minutes she fell into a second attack. Her respiration became slow, shallow, appearing at rare intervals—perhaps four or five per minute. The pulse was almost imperceptible and her face was blue—almost black-blue—from asphyxia. Assistant physicians began to practice artificial respiration and rhythmic traction of the tongue. Almost any reader has witnessed the application of these methods in drowning cases at some summer beach. At the end of twenty minutes every method had proved unavailing. The last visible spark of animation had fled. The patient was quite black in the face, to use the doctors' own expression.

"Dead!" they said and one, in true French fashion, shrugged his shoulders. After all, she was only a street woman; the place was an asylum, or "poor hospital,"—and so much effort had been

wasted. It was not thought wise to carry the body to the Robinovitch laboratory on the second floor, lest some hidden spark of life might be jolted out. Even the doctors used the word might; they had seen too many cases of death to be deceived by this. Twenty minutes had elapsed after death before Doctor Robinovitch's electrical coil was brought in and the electrodes placed in their proper position for resuscitation; the cathode in the dorsal region, the anode in the lumbar.

Imagine for a minute what this scene represented. Not one of the spectators expected a favorable result, though all were deeply engrossed in a situation surcharged with dramatics. Then the rhythmic excitations were begun and practiced for thirty seconds. Because the patient looked so thoroughly asphyxiated, judging from the color of the face, the operator shortened the period of the opening of the circuit. The change that took place was like the breaking up of storm clouds on a summer afternoon to make way for the full radiance of the sun. As the excitations were repeated the dark blue of the features changed to pale blue, then to an almost natural color. There was a quick, sharp sigh and the woman's eyes popped open.

"Oh! I feel so cold in the back!" she cried, with a shiver. It was the wet pad of cotton in the electrodes at her back.

A devout little nurse dropped a bottle of aromatic spirits she had been holding and crossed herself. "Back from the dead!" she exclaimed and the look in her eyes was half horror, half astonishment. The operator had expected scepticism on the part of the male physicians. One, witnessing this "reawakening," asked: "I wonder have you brought the soul back, too?" The woman, in her hour of triumph, merely smiled.

It had taken years of effort but the contracted muscles in the leg of the frog had been carried to the ultimate development of the principle they had revealed to the mind of the scientists. The dramatic force of this incident is bound to suffer by the necessary resort to surgical or technical terms, and it is only possible for each reader to construct his own mental picture.

Doctor Robinovitch did in Paris bring back to life a human being who had been declared dead, and has been, for the last year, in New York restoring hundreds of animals, pronounced dead by her confreres; animals deliberately shocked to death by electricians, only to be awakened at the end of twenty or thirty minutes by a curly-headed little woman whose work, when it finally leaked out and was published with all sorts of distortions by the yellow journals, furnished a most profound sensation.

Disbelief on the part of thousands of the old-school physicians and surgeons was inevitable; the very form of newspaper exploitation the operations received cast a shadow upon the work. In the first place, resuscitation of animal or human bodies represented the most extreme departure from the already established uses for electricity in medicine and surgery. It had established its right to consideration as a lulling or anaesthetic agency; it had no standing as a life-restoring force. Beauty doctors had used it in mild form; physicians had found it possessed nerve-tonic possibilities for neurasthenics, but in bulk electricity was used to kill. To the human mind it represented a legalized mode of death.

To Stephane Leduc, of the University of Nantes, the medical profession owes a debt for his original experiments with electric anesthesia in which Doctor Robinovitch was the first outsider to participate and whose ideas for human resuscitation went even farther than ever dreamed of by Leduc.

But it has been her work of resuscitation that has attracted world wide attention.

As regards the theoretical interest of the experiments conducted by Doctor Robinovitch they may be said to show that the extinction of life is a quite gradual process and that the physiological phases of it may by a convenient treatment still be remedied. Death thus would seem to be definite only when chemical alterations in the body have taken place.

Other results of immense practical value have been derived from cases of electric resuscitation. Electrocuted aniamls have in many cases been brought

back to life by rhythmic excitations with the same potential that caused death. This would go to prove, it seems, that the methods of electrocution employed in American prisons are not merely unscientific but barbaric; for while they are certain to bring death they accomplish it in a more gruesome manner, often making the termination of life a long-drawn-out spectacle extending over several minutes. Under the present system electrodes are placed on top of the head and against the leg. The Robinovitch theory is that, since the heart is the center of life, to kill by electricity one electrode should be placed on the forehead and another between the shoulders. Death then would instantly ensue because of heart paralysis and electrolysis of the blood. By her system 400 volts of current are sufficient to kill, while in legal executions 1,800 are used, burning the flesh and actually prolonging life, there being a distinct pulsation after the current is shut off. Second and even third shocks have been resorted to in many instances to cause death.

Kemmler, the first criminal put to death in the electric chair in New York state, on August 6, 1890, received an initial shock of 1,800 volts for seventeen seconds and still there were chest movements and heart beats. It required a second contact lasting seventy seconds to cause death.

Then there was the case of Guiseppi Sarducci, who on July 5, 1910, paid the death penalty for murdering Josef Dordano, an Italian detective. Two shocks were necessary to kill Sarducci in the death chair at Auburn prison. The first shock in which a voltage of 1,850 was used, lasted for one minute and three seconds. But this did not kill. When the physicians lifted the death mask the doomed man's eyes were open. His heart was still beating and his lungs were feebly pumping air into the body. So another voltage of 1,850 was sent through the body. The voltage ranged from 8½ to 9 amperes. The second shock lasted ten seconds and when the current was turned off Sarducci was dead. That is inhumanity which even a pagan nation should be ashamed to tolerate.

Recognition of the value of the Robinovitch experiments has been almost as prompt in America as it was in Paris, where the municipality fitted up an elaborate laboratory at great cost, including the cost of the instruments and the permanent maintenance of the quarters. The New York Edison Company invited Doctor Robinovitch to conduct a series of experiments in the presence of its officials and technical experts and the company's adoption of her instruments and system of operation for use in cases of accidental electrocution among its employes is regarded as almost certain. Owing to the superiority of electrical science in America Doctor Rovinovitch has made her home in New York a part of each year for the last five years. During this time she has been besieged by all classes of scientific investigators, each and all anxious to attend her clinics. There is a separate—and very interesting—story in the detailing of the ruses that have been practiced by writers and scientists to witness her experiments and obtain photographs. All of these attempts failed.

The First Plunge

by

Benjamin Brooks

THERE always has been, I suppose there always will be a broad jump off and a cold plunge for the youthful engineer between the last of his technical training and his first days in camp. I was no exception. Like an Oxford lawn, after constant proximity to books and book learning, I remained the greenest thing on earth. Cows would have eaten me with delight; but this was a mighty poor country for cows.

All day long I had stage-coached it through an inferno of dry, nondescript foothills over a road of unbelievable ruttiness and crookedness, and the sun and the dust had penetrated to the very core of me. The old stage-coach, as far as appearances went, might have figured in the days of '49. The hayseed-looking driver, who had trekked with old Jim Beckwourth, and fought Indians, and prospected for gold, and farmed for a living, actually had figured in those glorious days. The Mexicans on the back seat were dry and wrinkled and picturesque enough to date back to any period; but the gem of the collection was the fair, fat Frenchwoman on the front seat with me—a mysterious mixture of third-rate actress, circus performer and vagabond—wearing a marvelous yellow "property" wig, and a daringly broad hat over it, a traveling duster to cover a multitude of shabbinesses, and a pair of very sad, very high-heeled shoes. Her only visible baggage consisted of a strange parcel of whalebone and elastics wrapped in a fragment of newspaper. Alas, her figure was not one to tolerate restraint on a rolling stage at the temperature of 120 in the shade. A thoroughly miserable person, she yet formed the finishing touch to a picture out of Bret Harte's own book, and served to remind me that I was not the only callow feature of the day, but that the fair state of California—if one wander far enough into her hot little foothills—was still as young as ever; and that the fascinating game of adventuring and pioneering, of sudden riches and lavish spending was still going on, and I was part of it. But now the quest is not for gold, but for a far more precious thing—water; for the bounteous Sierras, having given up one fortune of gold, are about to bestow another out of the deep snow upon their crests, which, coursing down their steep flanks in foaming torrents with the first warmth of spring, temptingly invite the explorer to explore for just the right amount at just the right height and the investor to invest in the proper dams and high-line ditches and steep pipe lines and whirring generators and mile upon mile of electric wire to the nearest considerable town.

At a totally unheard-of post-office at the junction of two unspeakable roads I said farewell to the stage and its occu-

pants, threw my belongings on a springless "roustabout" camp wagon, and jolted off into the unknown. At length appeared a bare scorched promontory crowned with groups of rough pine shacks hideously adorned with tar paper, dusty with teaming and alive with mules and men. This was the main camp, and my destination. A group of young men in dilapidated khakis, floppy old hats and beards in various stages of neglect eyed me derisively as I passed into an improvised office and presented myself to the chief engineer.

There was no doubt in the world about his being the chief. A lean, powerful, bronze individual, with a keen eye peering from under his straw helmet and a commanding voice, he began without apologies or preamble to expose to himself shamelessly the whole of my brief and verdant past. No, I had never done this and that; no, I had never done thus and so; in fact, since murder will out, I might as well admit I was fresh from a technical college and have done with it. The unshaven ones suppressed a snicker.

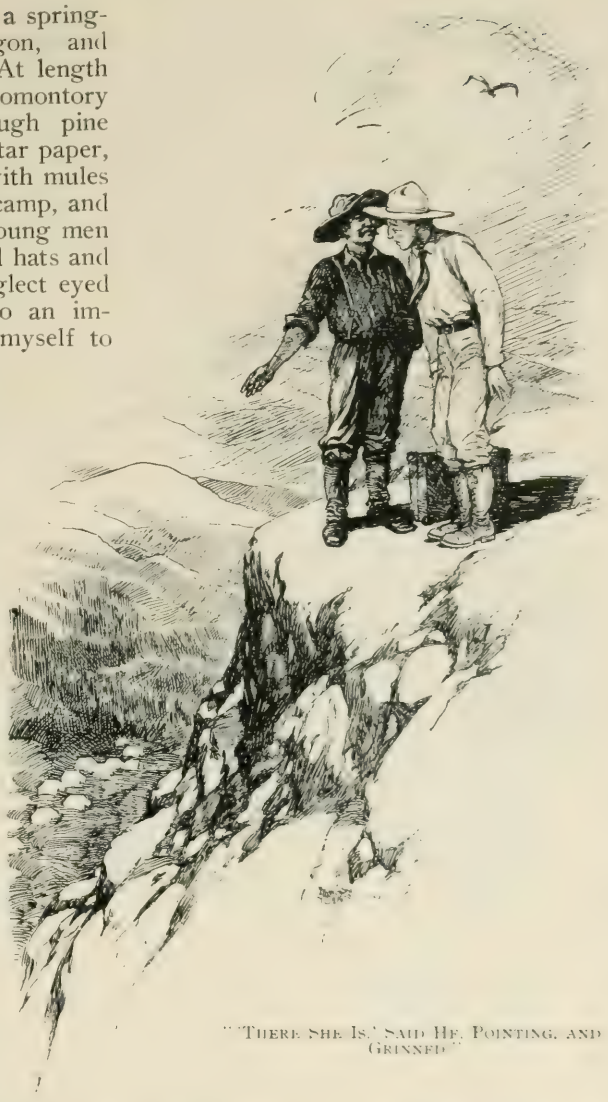
Well, well, the chief had hoped for a more mature engineer, but since I had come thus far he would give me something to do at one of the lower camps. One of the unshaven ones would show me; and taking me to the beetling edge of the promontory, he pointed far down the canyon to a group of what seemed to be large white stones, but which were in reality tents.

"There she is," said he, pointing, and grinned.

"But how do I get there?" I asked.

"The walking is pretty fair on the down grade," he replied, "and when you want to come out we'll send you a taxicab—or a wheelbarrow."

"Thanks!" said I, with as much dignity as possible; and grabbing my heavy suitcase, I began the seemingly perilous descent of 1,400 feet over loose boulders and crumbling granite, sliding, stumbling, dripping from every pore and gasping for breath in the hot dust of my own making.



"'There she is,' said he, pointing, and grinned."

I arrived at the lower camp very limp and dejected and thoroughly disgusted with the glorious calling of engineer. But further disillusionment was to follow, and utter loneliness beside. It was a small camp comprising a few Mexican rock drillers and freight handlers, a few sad mules and an uncommunicative Chinese cook. From such unaccustomed company I drew disapprovingly away, and kept to my own dusty little tent. To pass the dreary time away I built myself a bunk with tin cans full of kerosene at

each post to keep away the ravenous red ants; selected the least odoriferous of the blankets and washed them in an iron wheelbarrow;—surreptitiously, so as not to appear tenderfoot or fussy; sewed on buttons and read ten-day-old papers. As for my duties, they were monotony itself

"Hiking over the Hot Hills with Bill."

—to count cement sacks, to check off provisions each day as they were lowered down from the upper camp over a rickety wooden cable hoist, to measure the amount of rock split out of the hill, and to wade each day at a certain hour into the river at a certain place and, with a queer little propeller instrument attached to a ticker worn over my ear, to measure the velocity and quantity of the river that flowed by. This was very interesting to do once, but after weeks—! A strange melancholy began to lay hold of me; the forerunner of madness, I thought, little suspecting that it was nothing but that old malady, homesickness. Only one thing prevented my walking out of these intolerable foothills and back to civilization: I didn't know the way, and I was ashamed to ask.

But Purgatory is not necessarily perpetual; and finally came an order for me to straddle the provision car and be hoisted up the mountain to the main camp. Here at least was variety and companionship. I became general Man Friday to a long-legged, good-natured surveyor named Bill. It was while cutting brush and pounding stakes and hiking over the hot hills with Bill that I began to get over my homesickness and perceive the glory of the undertaking — this great project of hunting down and harnessing water for perpetual use to mankind. There was a real romance and wonderment about it after all; in the long lines of dusty freight teams tugging desperately over the hills with their great loads of machinery guided all by one man with one string of rope and one string of expletives, and in the swarthy army of Mexicans piling up concrete in the dam and drilling the water tunnels, and in the little swarm of riveters joining the great pipe together or lying fainting on the ground with heat and calling to Gugna Din (alias Juan Juares) to pour water on them from his wet canvas bags. These were the pipes that were to carry water down the mountain and deliver it at six hundred pounds pressure to the water wheels that were to spin out electricity at the frightful pressure of sixty thousand volts to be sent over the hills and far away to the land where trolley cars live, and street lamps and power-craving factories. When the day's work was over and the tired mules unhitched to roll and the sweating happy army came

straggling in, followed by the monotonous, droning cry of Fi-yar! Fi-yar! which would in turn be followed by loud explosions and clouds of dust, it was with a feeling of real pride that I took my place in the cook-house line, crowded past the fierce sentinel at the door with his disciplinary pick handle, and began piling my tin plate high with corned beef and cabbage. Surely it was a tremendous work, and I was part of it!

"Can you cut hair?" asked Bill.

"No!" I replied.

"Well say, Kid, where did you get your technical education without learning to cut hair? Every engineer's got to know how to cut hair. Time you learned. I'll let you begin on me. Then I'll cut yours; we both need it."

Thus began a jolly old friendship; and friends are mighty close in the wilderness. We managed to be room-mates, too; and lying in barbarous nakedness on our bunks through the hot evenings, used to hark back to the good old days in Frisco town or the delights of Denver.

"I'd give a month's pay," exclaimed Bill, "to be standing on Russian Hill now, watching the lumber schooners sail in through the Gate;—that is, I'd give it if it was coming to me."

"Why isn't it coming to you?" I asked innocently. "What happened to it?"

"Gad, I wish I knew, Son. Here I've been in this dump twenty-eight months now, and if I was fired tomorrow I'd have to walk out."

A great old vagabond was Bill—one-time mule skinner, dike builder, fruit picker, lumberman, sailor, explorer, brush cutter and stake pounder, and finally surveyor. But they were all the same—young fellows without a care or a cent in the world (though how they spent their money was a mystery to me) whose work and whose meals were provided each day, who could carry their beds on their backs in true scriptural fashion, but never a thought of the morrow. Some there were who had not seen a trolley car nor a policeman nor a church spire in five years. "Just as well I haven't, too," confessed one. "Last time I hit Denver I had a thousand all saved up to file on some Government land. What did I do but fall off the wagon first night in town! Where did the money go? Honest, Boy, I never could remember; but believe me, it was a royal good time!"

To me, reared in a methodical home and fresh from a methodical school, such reckless vagabondia was unbelievable—almost wicked. To drift through life in a wilderness, penniless, objectless—my profound disapproval must have shown; but they only laughed at me.

One Saturday night came rumors of a big time at North Ford—a dance, a supper; the telephone girls from Fresno would be there, the two buxom daughters of Mother Hanrahan who did our washing would be there. Tickets only five dollars, including admission to Antonio's bar and dance hall, supper, and mule-power transportation; "refreshments" extra.

We went—in our cleanest khaki and newest hobnailed boots, winding along through the dark mountain pines and singing to the stars. In a little clearing in the forest beside a general merchandise store and a post-office stood Antonio's, a blaze of light. Inside, the floor was waxed invitingly; a picturesque female Spanish orchestra, fat beyond belief and shining with the heat, played as only the Spanish can play, and wore red geraniums in their hair. The bar and looking glasses behind it shone with marvelous brilliance. It looked mighty good after such a monotony of granite and cement and stake-pounding. But the feature of the evening was an apparition in green satin and spangles with beautiful golden hair, capering upon a small platform at the end of the hall and singing a topical song. There was something familiar about her. That beautiful blonde hair—where had I seen it? Suddenly I remembered. The spangled beauty was no other than the fat Frenchwoman of the stage-coach; but now how different—how gorgeously different! What had induced me to imagine she was fat? And while I wondered and admired she finished the song, tripped gayly toward me across the smooth floor, and to my unbounded confusion, greeted me with a "Howdy, old Pal!" and warmly shook my limp hand.

"What!" exclaimed my engineer comrades, "Old Pal? Old Pal? Gentlemen,

"GREETED ME WITH A 'HOWDY OLD PAL!'"

the new boy has deceived us. He has posed as a thoroughly superior nice young man fresh from the freshest fresh-water college, and he now proudly and unblushingly claims long acquaintance with Lady Lil, Queen of the Alcazar in winter and Nymph of the Sierras in the good old summer time! Now what do you——?"

"But I - let me explain," I began desperately.

"Yes, my son," said Bill mockingly, "do explain. I only hope you can."

And then the absurdity of the situation dawned on me. "Gentlemen and fellow stake pounders," I said stoutly, "on second thought there is no explanation; but let us all step to the bar and drink to the renewal of old acquaintance."

The Nymph of the Sierras beamed: but I must hasten to do the lady the justice to say that she was a most harmless though very thirsty charmer, and interfered not a bit with an innocent, rollicking rough-house dance which lasted until gray dawn.

Yet, as we jolted off through the early dusk singing the ancient chorus:

I swear by old New Jersey,
And drink Hoboken beer,
I'm a rambling wreck from Stevens Tech
A mechanical engineer,

I had already computed that, one way and another, there would be mighty little coming to me on payday.

A day or two after this important date, I sat a little way out of camp upon a pinnacle of granite overlooking a vast panorama and thinking how, after all my disapproval of such recklessness I also was broke, and, if fired, would have

to walk out of camp. And yet—and yet—

It was a very beautiful evening. The noise of the final cannonading had echoed away down the canyon into dead silence; and the dust from it lay in a faint golden haze between me and the great misty Sierras, so tall and so grand. Far down in the abyss droned a white waterfall. A Mexican, having filched a pail from the cookhouse, was washing a shirt and singing a ballad of love as they make it in Spain. I could hear my co-laborers frolicking in their shower bath (an augmented leak in the old flume) and wrestling wet and slippery for the soap. They were all such happy, care-free noises. Suddenly a big broad smile began way down in the very soul of me and spread—a smile of huge contentment. Verily it was good to live and hunt water in the mysterious old Sierras; and as for money, what would I do with it to make me happier if I had a million?

What! Was I, too, turning vagabond? Was this the beginning? Was I also to become a penniless, happy-go-lucky, wandering engineer? Was I? Well!!

THE PORK CHOP FLYER

By

F. G. MOORHEAD

IOWA'S hog money would pay the salaries of every crowned head in Europe for an entire year, with enough left over to keep King Manuel's dancing favorite in new diamonds every month. And yet the farmers of the Hawkeye state are losing $30,000,000 hog money every year because of carelessness.

Something like 200,000 of his agricultural brothers pursue the even tenor of their way raising only two-thirds the number of pigs they might with the same exertion, the same equipment and the same stock. It is to retain the uselessly slaughtered 5,000,000 pigs which annually give up the struggle for existence in Iowa alone that a campaign is being waged which promises to make a rich state richer.

When the authorities in the animal husbandry department of the Iowa State College of Agriculture looked over the hog statistics for the eighteen months ending June 30, 1910, they realized something must be done and right quickly. These statistics showed that there was a shortage of over five million hogs at the chief packing centers in 1909 and at the same points a shortage of nearly three million hogs for the first six months of 1910. Very evidently things were going from bad to worse.

The first thing they did was to send out inquiry blanks to 431 representative and widely varied farms of the state. The replies opened their eyes to conditions. They showed that the average number of brood sows to the farm is eighteen, while the average number of pigs raised per farm per year is seventy-four, of which twenty-five are lost, mainly through carelessness in handling and feeding. The highest 108 farms reported an average of 6.4 pigs to the sow; the lowest 108 farms showed an average of only 2.6 pigs per sow. The average of all the farms was four pigs to the sow.

A few minutes figuring showed why Iowa was facing a hog famine. One-fourth of the farmers interrogated were raising only one-third as many pigs as the other one-fourth, while the average for the whole number was only two-thirds what the average should and easily could be, with care and proper feeding. It did not take long to figure

out that the difference between the highest and the lowest one-fourth of the 431 farmers interrogated meant a difference in hog profits of $30,000,000 each year.

THE CROWDS WERE INVARIABLY SIMON PURE FARMERS.

Nor was it hard to prove that an increase of one pig to the litter meant an addition of $15,000,000 in hog money for the state each year; while an increase of two pigs meant $30,000,000 more hog money, or $300,000 for each of the ninety-nine counties in Iowa. It was the average of twenty-five pigs lost on each farm each year which wrinkled most of the experts' brows, for there are 209,000 farms in Iowa, which means that 5,000,000 little pigs give up the ghost uselessly each year.

The situation being thus made clear, what was to be done? The answer came promptly. Run a special train carrying animal husbandry experts from the state agricultural college to teach the farmers how to get six pigs to the litter instead of four and how to save the five million pigs annually lost. This was the inception of the Breakfast Bacon special, as it was officially termed, or the Pork Chop Flyer, or Sausage Express, as it was colloquially dubbed.

The special train idea is responsible for many of the good things which Iowa has done in the past few years. It originated in the fertile brain of Professor P. G. Holden, the famous seed corn man, some seven or eight years ago, and has been worked over to preach the gospel of selecting and testing seed corn, using the King drag on dirt roads, raising

PUTTING INTO PRACTICE SOME OF THE THINGS LEARNED ON THE PORK CHOP FLYER.

THE EXPERTS SEE NO REASON WHY LITTERS OF THIS SIZE SHOULD NOT BE THE RULE, NOT THE EXCEPTION.

more and better dairy cattle and beautifying the farm homes. Whenever the need of any agronomic preaching is realized in Iowa a conference is held in the office of some railway general manager and forthwith there puffs out over the prairies a special train of day coaches and Pullmans, the farmers drop the lines and rush pell mell to the depot and the next year Iowa breaks the record again.

It remained for the Pork Chop Flyer to surpass the other trains, however, in the matter of varied interest. It traversed the lines of the Rock Island system for two weeks, visiting 117 towns and spreading the gospel of more hogs to 15,000 Iowa farmers. No sooner had it finished up the job in Iowa than it was sent to Kansas City and was routed out over Missouri, Kansas and Nebraska.

The Breakfast Bacon special was a veritable three-ring educational circus. There was something doing in every ring at the same time. In one ring, or audience coach, was a domestic science teacher instructing the women how to cook and serve pork and its by-products in wholesome, palatable fashion. In another was a packing house representative showing the youngsters how piggy meets his death and comes to be resolved into ham, bacon, chops and even fertilizer. In the third were animal husbandry experts from Ames showing how, by care and common sense feeding, the litters may be increased from four to six, and millions be added to the state's hog money.

The domestic science teacher was a pretty, brown-haired slip of a girl who converted women and men alike. "Don't fry, fry, fry your pork in an everlasting sea of grease" was her constant cry and then when the worried-looking farm wives wanted to know what in the world there was to do with pork besides fry and fry again and then fry again for a change, she passed out typewritten slips on which were a dozen or more recipes, guaranteed to make

CORPS OF INSTRUCTORS, NEWSPAPER MEN AND CREW OF THE PORK CHOP FLYER.

ABOVE THE AVERAGE LITTER IN IOWA TODAY, BUT NOT LARGE ENOUGH.

every man declare that he had never tasted good cooking before in his life and every housewife wear the smile that won't come off. There were recipes for fried bacon, pork tenderloins with sweet potatoes, fried salt pork with codfish, baked pork chops and dressing, roast pork and apples, crisp salt pork and so on ad infinitum until piggy had given up the last bit of the ghost and a stateful of hungry people had licked the last remnant of flavor from lips that had never known before how good pork really is.

The public school children were being regaled meantime with a gory story of adventure of how Mr. Pig is hammed and baconed and tinned and what-notted into all the commercial products of the packing houses.

From an investigation of hog raising conditions in Iowa the experts at Ames have learned that trouble at farrowing time and loss of the little pigs is largely because the mothers are too fat and the object of too little care when the litters are farrowed. Therefore the mother should be carefully fed before farrowing. She should be given muscle rather than fat producing foods. And that the farmer may be able to give the mother good care when the litter is farrowed

CARE AND COMMON SENSE IN FEEDING WERE URGED ALL ALONG THE LINE.

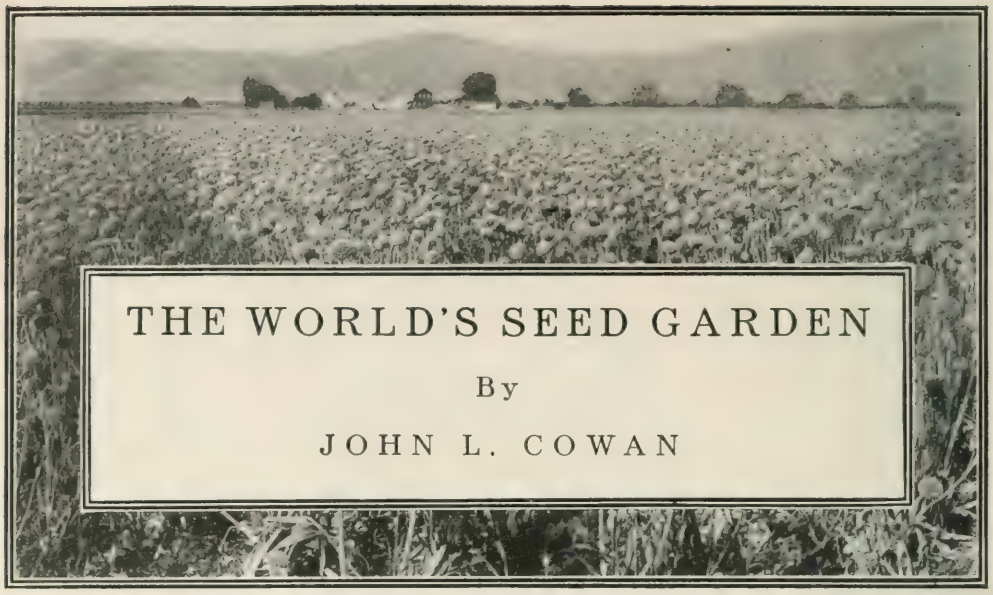
the experts advised that a record of the farrowing time be kept. Then they may know when to expect the litter and be prepared to care for the little pigs.

At this point in the lecture the experts showed a model shed for farrowing. These model sheds are designed so that each will shelter one sow and her litter. They are light, dry and free from draughts. A small door in the rear enables the farmer to arrange the pigs so that the sow will not crush them.

Some of Iowa's Millions in Hog Money En Route to the Mint.

Once farrowed the pigs must be carefully fed. At first the experts taught day after day the sow should have very little to eat and then she should be fed more or less as her pigs grow lean or fat. But the pigs must not be stunted at weaning, and the way to prevent a check in growth at that time is to feed the pigs either skim milk, tankage, or dried blood with other feeds until their stomachs become adapted to coarser foods. Beyond the weaning stage the hogs must be fed less corn. Cheap pork is the result of green feed. Corn is too expensive to make up more than a small portion of the diet of Mr. Pig. A hog should have some grain every day of his life after weaning but the ration should be light. Alfalfa and clover were recommended as good and cheap foods. Oil meal was also commended by the experts as diet for the growing pigs. But good pasturage was especially urged because of its small expense as compared with corn. An acre of alfalfa pasture will put, during the summer, from 500 to 1,000 pounds gain on pigs. An acre of clover is worth from one-half to two-thirds as much as alfalfa. An acre of dwarf Essex rape sown early and pastured through the season will put more gain on pigs than a ton of corn, and the pigs gather it themselves.

As the farmers listened they nodded their heads and even gave audible Methodistical "amen" to a doctrine which they realized full well needed to be preached. It was not that they did not know, it was more that they had forgotten or become heedless. The Pork Chop Flyer came along, and because the talk was practical and made by men who were really farmers like themselves they remembered, and made a mental resolve to go home and save those twenty-five little pigs and make the litters of their eighteen sows a hundred instead of only seventy-four.



THE WORLD'S SEED GARDEN

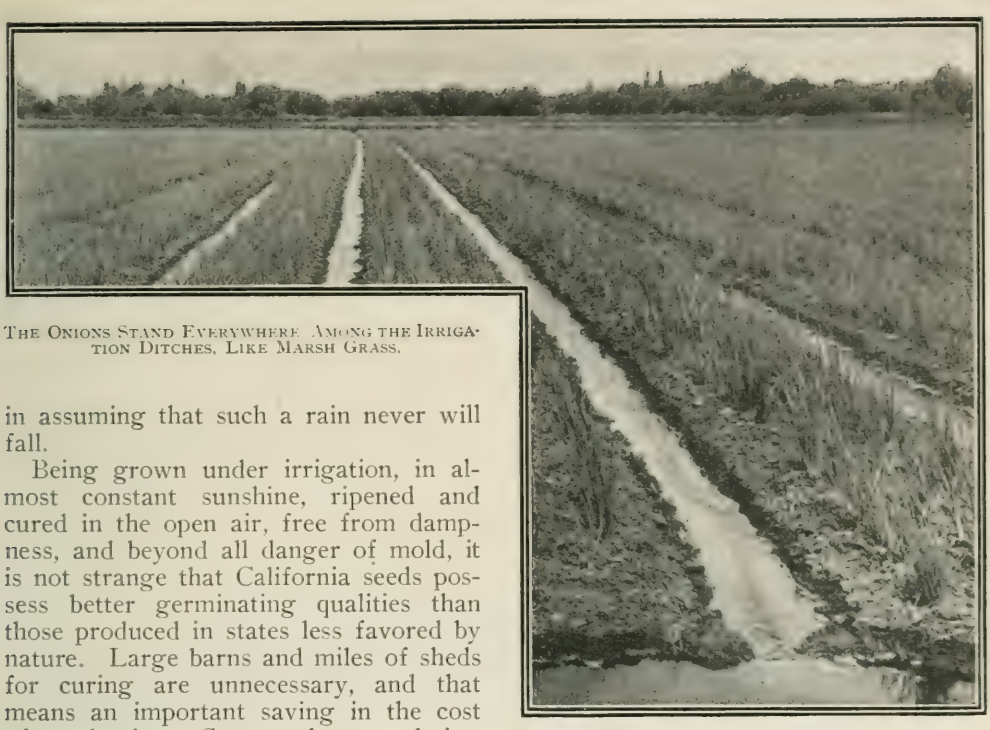
By

JOHN L. COWAN

IN every part of the civilized world, seedsmen and grocerymen dole out in little ounce, or even half-ounce, packages the garden seeds that the growers of the Santa Clara Valley produce by the ton or by the car load. For in that wonderful valley, in the shadow of Mount Hamilton and in sight of San Francisco Bay, are located the world's greatest seed farms. Probably not less than fifteen thousand acres are devoted to the production of vegetable and flower seeds and bulbs, some varieties of which are distributed throughout the civilized world. This is notably true of lettuce seed. It is estimated that fully ninety-five per cent of all the commercial lettuce seed grown in the world is produced in this valley.

When the average farmer, or gardener, or suburbanite buys a package of garden seed at the nearest store, and sees on the exterior of the package the imprint of a seedsman whose name has been a household word for years, he naturally supposes that the seeds were grown on the farms of that particular individual or firm. Some varieties of seeds, of course, are so produced; but by far the larger quantity of what may be called the standard seeds are grown on the great seed farms of California. Nurserymen in Michigan, Ohio, New York, Pennsylvania and every other state in the Union prefer, for very sufficient reasons, to purchase California seeds, place them in their own packages, and distribute them to their customers. In the first place, they can buy seeds from California, in large quantities, cheaper than they can grow them on their own farms. In the second place, the California seeds possess better germinating qualities than those grown in any other state. The climate of California gives to the seed farmers of that state an advantage in seed production that places them beyond the reach of dangerous competition.

From the first of May until the middle of September, as a rule, hardly a drop of rain falls in the seed farming districts of the Golden State. This has its obvious disadvantages, but these have been counteracted by irrigation. Its advantages are priceless. Most flower and vegetable seeds are small, delicate, difficult to collect, hard to cure, and very easily spoiled. In this favored region, they are harvested when just at the right stage of maturity, without the need of considering the weather; cured in the sun, and threshed and packed without fear of thunder storms or drizzling rains. A hard rain in July or August would ruin seeds worth hundreds of thousands of dollars; but such a rain never has fallen, and the seed farmers feel perfectly safe



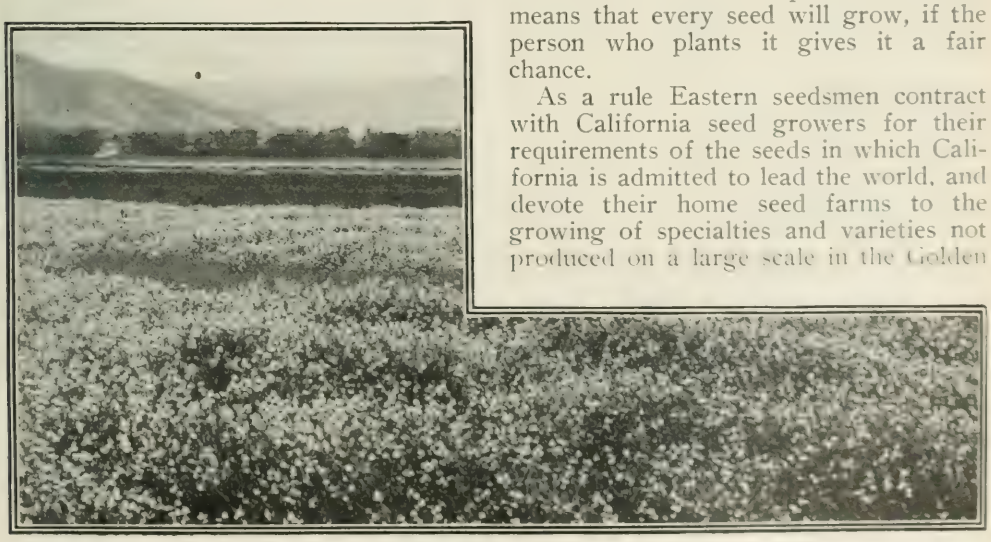
THE ONIONS STAND EVERYWHERE AMONG THE IRRIGATION DITCHES, LIKE MARSH GRASS.

in assuming that such a rain never will fall.

Being grown under irrigation, in almost constant sunshine, ripened and cured in the open air, free from dampness, and beyond all danger of mold, it is not strange that California seeds possess better germinating qualities than those produced in states less favored by nature. Large barns and miles of sheds for curing are unnecessary, and that means an important saving in the cost of production. Steam plows and improved machinery of all kinds are employed, and all operations are conducted on a scale of great magnitude, reducing the cost to a minimum, and making it practicable for California growers to sell to Eastern seedsmen at prices lower than the cost of production on Eastern farms.

Careful germination tests are made before seeds are shipped to Eastern customers, and none are packed for shipment unless at least eighty-six per cent are found to be fertile. As a rule the germination test averages between ninety and ninety-five per cent, and often reaches one hundred per cent. That means that every seed will grow, if the person who plants it gives it a fair chance.

As a rule Eastern seedsmen contract with California seed growers for their requirements of the seeds in which California is admitted to lead the world, and devote their home seed farms to the growing of specialties and varieties not produced on a large scale in the Golden



SWEET PEAS GROWING THICKER THAN WEEDS.

State. Comparatively few varieties of flower seeds are grown for the wholesale trade in California, and very few seeds of any kind are grown that are not definitely contracted for in advance of planting time.

Usually the California growers agree to plant one acre of land in a certain flower or vegetable, for so many hundred pounds of that kind of seed ordered. For example, if an Eastern seedsman agrees to take 4,000 pounds of onion seed, the California grower will contract to plant ten acres of land in onion sets to produce the amount specified—or one acre for each 400 pounds. It is an unwritten law of the trade that the purchaser take the surplus produced on the acreage planted for the fulfilling of the contract with him; but sometimes the grower assumes the responsibility of disposing of the excess production on the open market. Similarly, one acre is planted for each 500 pounds of lettuce seed wanted; one acre for each 800 pounds of carrot seed, one for each 900 pounds of garden peas, and one for each 1,100 pounds of sweet peas.

No season of the year can be considered a slack time for the seed farmers. Every month has its appropriate labors. January and February see the plowing and preparation of the soil in full blast, and most of the planting completed. March, April, May and a part of June are devoted mainly to weeding and cultivation; and it must be remembered that these great seed farms, covering thousands of acres, are tilled and cared for just as an Eastern farmer cares for his garden. In fact most gardens contain more weeds and show more evident signs of neglect than can be discovered on any well managed seed farm. In July the harvest begins, continuing in full blast through August, and is finished in September, before the fall rains begin. Next the seeds are cured and cleaned; and shipments are made from September until December, when plowing begins again in preparation for the next season's seeding.

Despite labor-saving machinery, however, much of the labor is necessarily performed by hand. Some varieties of seeds are drilled in, but bulbs must be placed in the rows one by one by patient fingers. The production of onion seed is prodigal of time and labor, requiring two years. First the seed is drilled, and cultivated and weeded with all the care that the ordinary farmer gives to his onion beds in his little garden producing the small onion bulbs or "sets." The next year these are planted for the production of the seed, being carefully selected with respect to color and shape, so that the bulbs will yield seed that will in turn produce sets true to name and description.

There are not less than 3,000 acres devoted to the production of lettuce seed, this smallest and most delicate of vegetable seeds, but the yield is more than 1,500,000 pounds annually. Sweet peas are grown on 3,000 acres, yielding at least 4,000,000 pounds. Four thousand acres of land are devoted to the production of onion seed, requiring the planting of 20,000,000 pounds of onion sets each year. Radish seed is grown in thousand acre tracts, and carrot, collard, celery, asparagus, mustard, kale, leek, kohlrabi, parsley, spinach and tomato seeds are produced by the ton.

Of flower seeds, the sweet pea leads in bulk and importance; but large quantities of nasturtium, balsam, calendula, pink, aster, cosmos, candytuft, mignonette, poppy, phlox and verbena seeds, and many varieties of bulbs—as dahlias, lilies and calla lilies—are grown on contract for eastern seedsmen. About fifteen thousand acres of land in the Santa Clara Valley are devoted to seed and bulb production; but that by no means represents the full extent of the industry in California. There are many large seed farms scattered throughout the state, but the largest in the world are in this valley, which is approached by no other region of equal area in this or any other country in the magnitude and importance of its seed producing industries. Holland and Germany excel California in the production of flower seeds—excepting sweet peas and a few other specialties—but in the growing of vegetable seeds they fall far behind.

The only reason why California has been unable to compete with Old World countries in the growing of flower seeds is because of the labor handicap. Most flower seeds require hand labor for their

collection and cleaning, making the extensive employment of labor-saving machinery out of the question. Practically all the hand labor on the California seed farms is performed by Chinese and Japanese, although Hindus are now becoming a factor of some importance in the labor market. It will surprise many people to know that the Chinese are esteemed as the most valuable of laborers for industries of this kind. They are steady, reliable plodders, apparently never tiring, and caring not at all how ardently the sun may shine. Moreover, they can be depended upon to stay with the job just as long as the job lasts. On the other hand, the Japanese, although quicker to learn, never can be depended upon; but have the habit of quitting, without pretext or reason, just at the time when their services are most needed. Owing to the operation of the exclusion laws, Chinese labor is becoming scarce; and the seed farmers have an infinite amount of trouble finding sufficient help of any kind. The Hindus, now arriving from the Orient in considerable numbers, are the most inefficient laborers of all, being lazy, ignorant and unreliable. However, the seed growers, in their rush season, are glad to get laborers of any description. Doubtless when California becomes thickly populated, and unskilled labor abundant, the state will be as famous for the production of flower seeds as it is now for the

ONIONS AND LETTUCE GROW IN BEWILDERING LUXURIANCE.

MILE-LONG ROWS OF CUPID SWEET PEAS.

vast proportions of its vegetable seed-growing industry.

Almost as surprising as the magnitude of the business is the great variety of seeds of well known vegetables produced. One large seed farm produces seventy-four different varieties of lettuce seed and one hundred and twenty-five of sweet peas. Another contracted for delivery in the season of 1910 no less than thirty-five varieties of onion seed, thirty-two of radish and thirty of aster. So it is throughout the list of popular vegetables and flowers. Each seedsman demands certain specialties that happen to be favored by his customers, and makes his contracts accordingly. Furthermore, each of the great seed growers is constantly striving to originate new and improved varieties—superior to the old in color, size, flavor, or some other particular. For this purpose men of special qualifications are employed; and these are always engaged in selecting, hybridizing and crossing numberless plants in the hope of producing something that shall be both new and meritorious.

Some seeds are threshed by means of steam threshers, just as the farmers of the East and Middle West thresh out their wheat and oats; but other varieties must be flailed out with the primitive implement that modern machinery has entirely displaced for ordinary farm purposes. Lettuce is one of the most difficult of seed farm crops to handle, on account of the small size of the seeds and the great loss sure to result if allowed to get the least bit over-ripe before harvesting. The upper parts of the stalks, on which are the seed vessels, are cut off and carried to large squares or sacks of cloth. They are then conveyed to thirty-foot squares of canvas, upon which they are spread to cure. Two weeks are required for this, even in the

daily sunshine of a California summer, the stalks being turned and stirred every day. The seed is then flailed out, cleaned by winnowing, sacked and stored for shipment, being sent to every civilized country in the world, and to some that hardly rank as civilized.

Seed farmers have their troubles, like everyone else. One of the worst of the pests they have to contend with is the gopher. On the larger farms there are men who do nothing but trap and kill gophers and dispose of their dead bodies, for these destructive little rodents infest the seed farms by the tens of thousands, and the traps must be baited every day of the year. Poisoning is practiced to some extent, but trapping is found to be the surest way of holding the pest within bounds.

The Santa Clara Valley is most widely renowned as America's greatest prune producing center; but it is evident that it has another claim to distinction. There is hardly a person in the country, who plants seeds at all, who has not sowed seeds grown somewhere in sight of the Lick Observatory on Mount Hamilton.

MAKING WHEAT WITH THE BIG MUDDY

By

FLORENCE L. CLARK

WHAT of the Missouri, pending the fair but postponed day when its meandering waters are coerced to serve navigation and splendid steamers laden with wheat, wool and flaxseed lift anchor at the docks in Montana and the Dakotas for St. Louis and the Gulf? Shall it be allowed to continue willfully on as in the past, eating away the land, worming new channels in fertile counties and making a general nuisance of itself spoiling the map, or shall it be made to serve some useful end in the development of the empire it traverses?

At Helena, Montana, they have answered the question by damming up the channel, thereby transforming the river's current energy into factory power. In North Dakota they are making ready to convert the "Big Muddy" into a utility worth many millions to the state. There, today on the banks of the Missouri pumps big and little are a-chug chugging. Ask what these pumps are so busy about and you will be told they are lifting water from the river up the hillsides to wheat fields fifty to seventy-five feet higher up.

It is a unique scheme of making a half dozen kernels of wheat grow where one grew before—this scheme of pumping a river into the hilltops—but entirely practicable in western North Dakota due to the immense quantities of lignite coal. The lignite provides first class motive power for the pump handles. It abounds along the entire course of the river through the state, usually on government land. So it is both accessible and cheap. The mere cost of digging ordinarily represents the price of it.

By a fortunate provision of Nature many acres of rich bench land lie in North Dakota just back from the Missouri with its idle waters and omnipresent coal beds. These areas are level in extent and well adapted to irrigation. During the last few years, homesteaders have taken up some of this bench land and have experimented in a crude way with raising water from the river to their claims. Small centrifugal pumps and threshing engines have been used. With lignite serving as fuel for the engines, the homesteaders have succeeded in generating sufficient power to water land at quite an elevation.

Their success suggested to the gov-

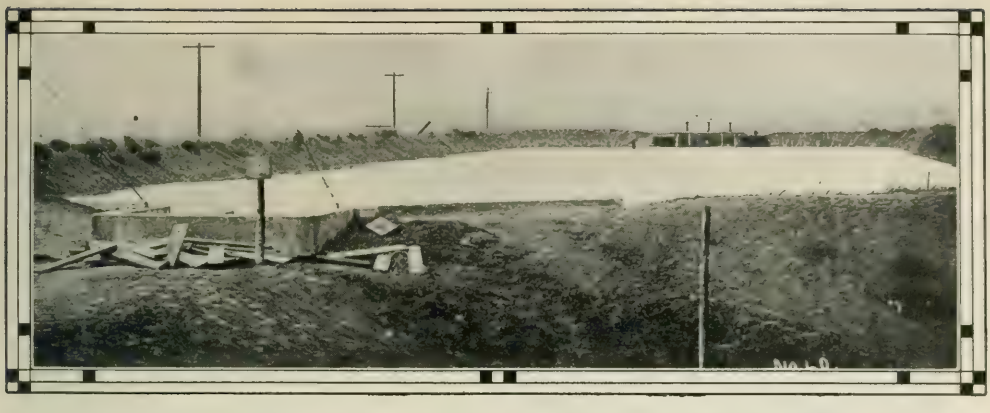
A SETTLING BASIN ON THE WILLISTON PROJECT, NORTH DAKOTA, FILLING WITH WATER.

ernment the practicability of irrigating large tracts in similar fashion. As a consequence, the Reclamation Service now has a number of such pumping projects in North Dakota. Two are already in operation in the northwestern part of the state, at Williston and Buford.

The area under the ditch on these two projects is not large—only about 25,000 acres. They for that reason might be considered of small importance if it were not that, in building them, the government has evolved a new plan of irrigation which insures the reclamation of many times 25,000 acres.

By virtue of this plan, the government acts in the capacity of miner as well as engineer and farmer. A ten foot coal vein located on government land near the town of Williston is worked and coal carried from it on a narrow gauge railway to a power plant near by. Here, the lignite is converted into electrical power and then transmitted to the two pumping stations at Williston and Buford. These pumping stations are most ingenious. It was not practicable on account of the ever-changing course of the river, to erect pumping stations on shore. A unique substitute was contrived. Barges with the pumps on board were set afloat on the river. In order that the barges might accommodate

A HARVEST OF WINTER RYE, MADE POSSIBLE BY THE WATERS OF THE BIG MUDDY.



A VAT FOR SETTLING THE WATERS OF THE MISSOURI BEFORE TURNING THEM INTO THE WHEAT FIELDS.

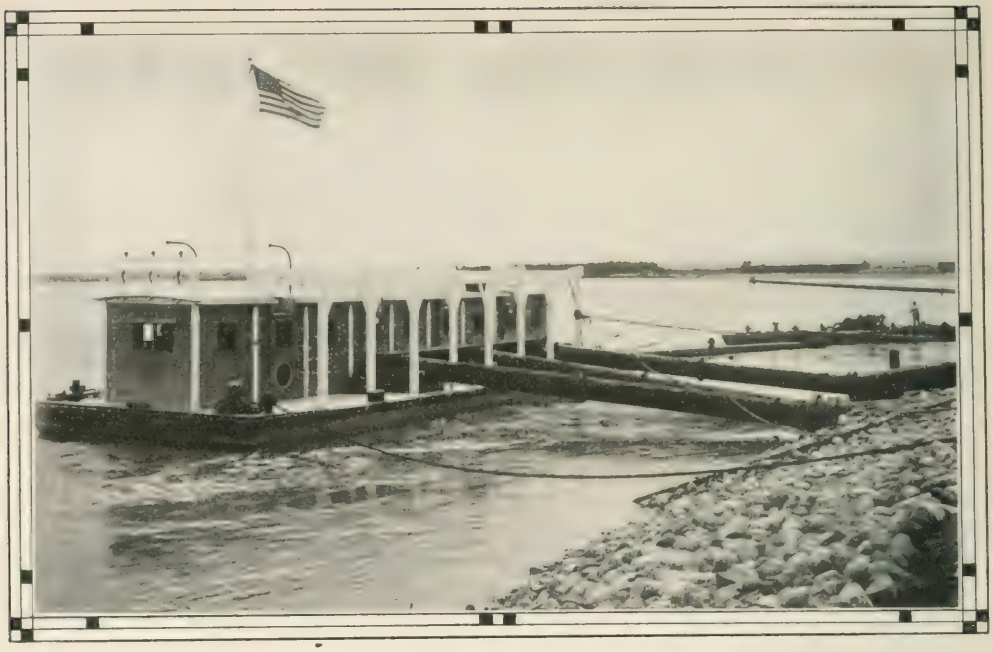
themselves to changes in the water level, they are connected with the banks by pipes fitted together with flexible joints. Through these pipes the pumps force the water of the river into settling vats on shore. Here they drop their silt previous to being turned into the main irrigation canal. From the main canal the water is raised by a succession of pumping lifts into higher lines of canals.

The plant has been operated to its full capacity the past season with the best of results. While drought has blighted the dry land round about, splendid crops of all kinds have been raised on the project.

Because of the success of the Williston-Buford project, the government now has under consideration the irrigation of bench land in a similar manner at several other places on the river. Wherever coal is present and the bench land is of sufficient size, such irrigation will be practicable. The United States Geological Survey reports that a number of such tracts exist on the tributaries of the Missouri as well as on the parent stream. On the whole about a quarter million acres in the state are adapted to irrigation by pumping.

Up to June 30, 1909, North Dakota had paid into the Reclamation Fund over $9,000,000. Oregon excepted, this sum is nearly double the amount contributed by any other state. Twice $9,000,000 probably will have gone to swell the Reclamation Fund before the last homestead has been "proved up" or the last coal claim paid for in North Dakota. A

Irrigating Potatoes on the Experimental Farm.



BARGE FOR PUMPING WATER UPON THE WHEAT FIELDS.

clause in the Reclamation Act provides that fifty-one per cent of all moneys derived from the sale of government land in the Western states shall be expended in the state from which it is derived in the reclamation of arid or semi-arid land. The Williston-Buford project has used up less than a million of the enormous sum which North Dakota has contributed and will contribute. Hence the early completion of other pumping projects in the Missouri Valley seems assured. Settlers also will be encouraged by the government to install private pumping plants where the bench land lies in too limited tracts for government service.

It is expected that most of this irrigated land ultimately will be devoted to intensified farming—forty acres constituting a farm unit, and sugar beets, alfalfa, potatoes and other vegetables and small fruits becoming standard crops. Dairying will grow to be an important part of this diversified farming.

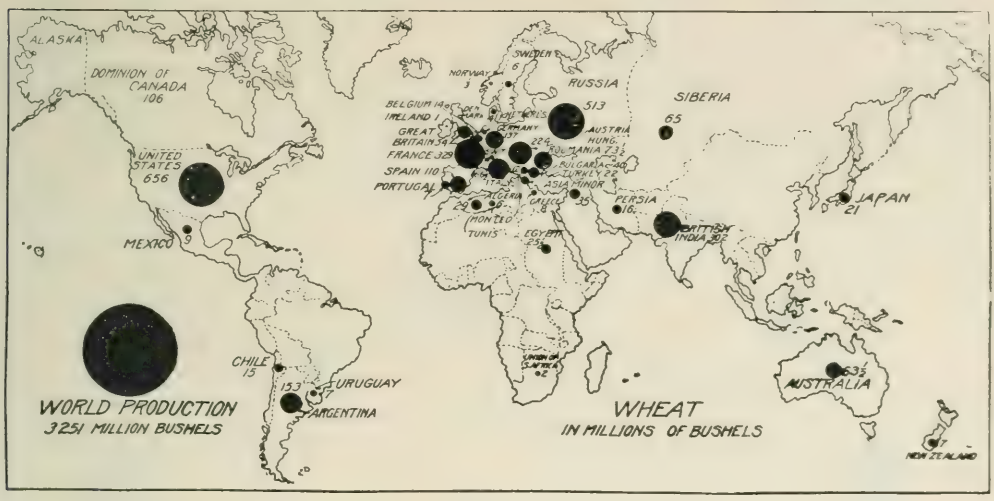
At the State Experiment Station, operated on the Williston project, sugar beets, equal in percentage of sugar content to any grown in the United States have been raised this year. Three crops of alfalfa have been cut. Forty bushels of wheat per acre have been raised and potatoes and other vegetables have yielded wonderfully well.

Paying crops of small grains can be grown ordinarily in western North Dakota without irrigation. Last year when State Commissioner of Agriculture, W. C. Gilbreath, journed down from Bismarck to the Illinois State Fair with the exhibit of North Dakota grains which won the "Blue Ribbon" over eighteen other state exhibits, it was noted that not a few of the entries of the successful exhibit had been grown west of the Missouri. Irrigation in western North Dakota, unlike irrigation on the government projects farther west, is not a necessity. Farmers can prosper without it. It does, however, insure a big increase in yield per acre and "no failure." Further than that it renders possible the raising of a great variety of crops which can not be grown on dry land. Best of all it opens the way for ten families to live where one now lives, and the addition of many thousands of tons of food products to the nation's supply.

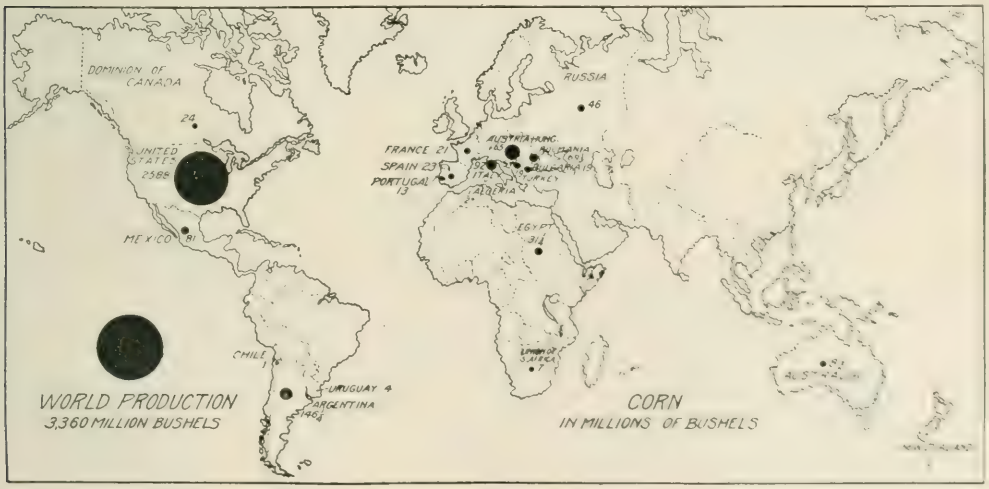
THE HARVESTS OF THE NATIONS

By WILLIAM A. DUPUY

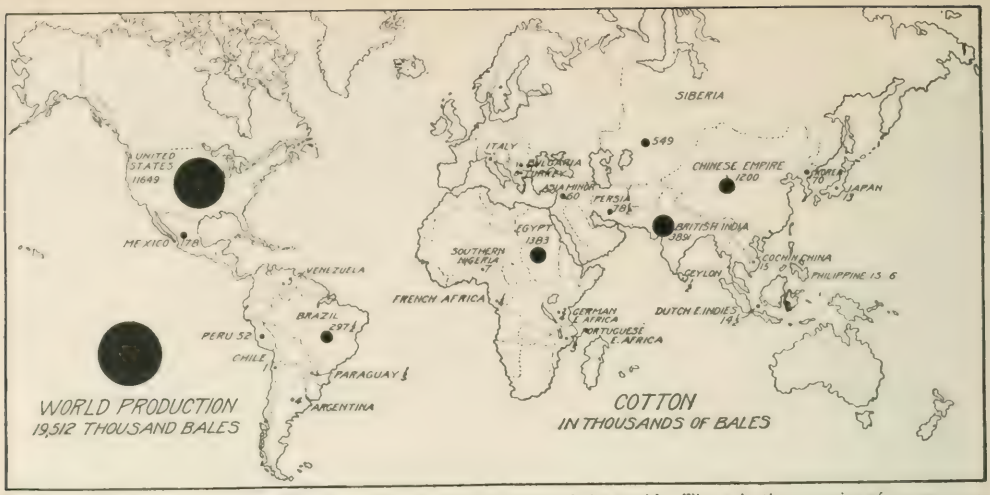
SOME genius of the Department of Agriculture has just succeeded in so sugar-coating the bitter pill of statistics as to make it attractive. Following are some of the interesting facts interestingly set forth in the recent bulletin.



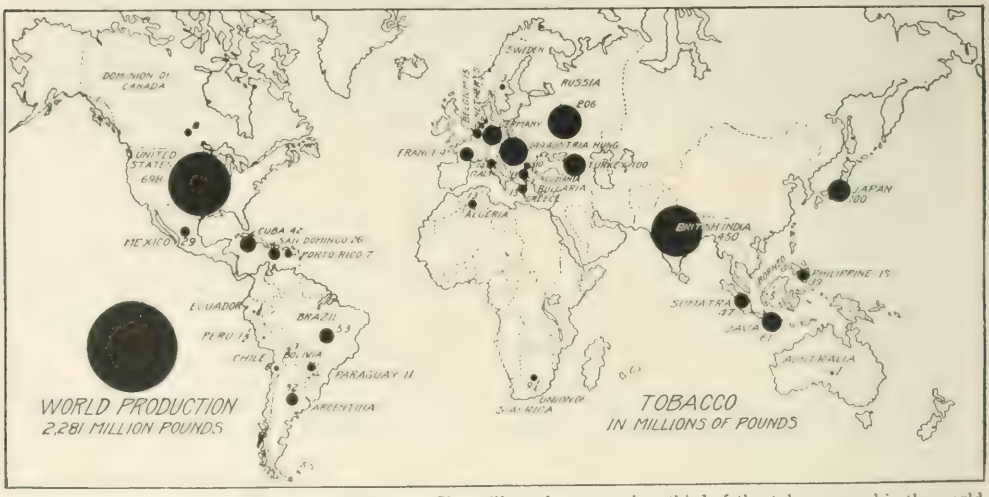
Wheat is the most important food crop in the world. There are more civilized people who eat it than any other product of the soil. Remembering this the American may look with considerable pride upon the world map of wheat production, for the United States has the biggest wheat spot of them all.



The United States comes nearer having a monopoly of the corn production than anything else of importance that goes into commerce. The corn spot of this country is but little smaller than that which represents the world production. Yet corn does not enter largely into international commerce.

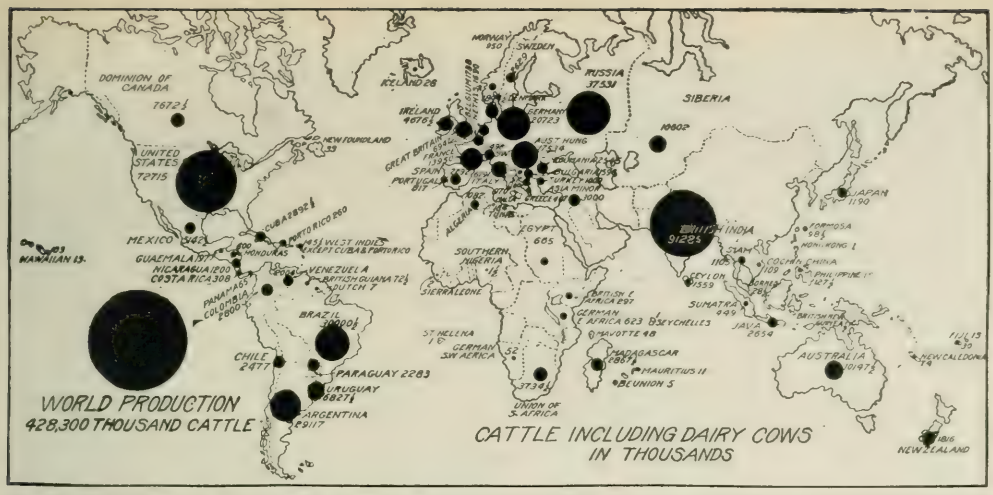


The United States produces a good deal more than half the cotton of the world. There is the promise of many years ahead before the price will again decline, for the use of cotton is growing much faster than its production.

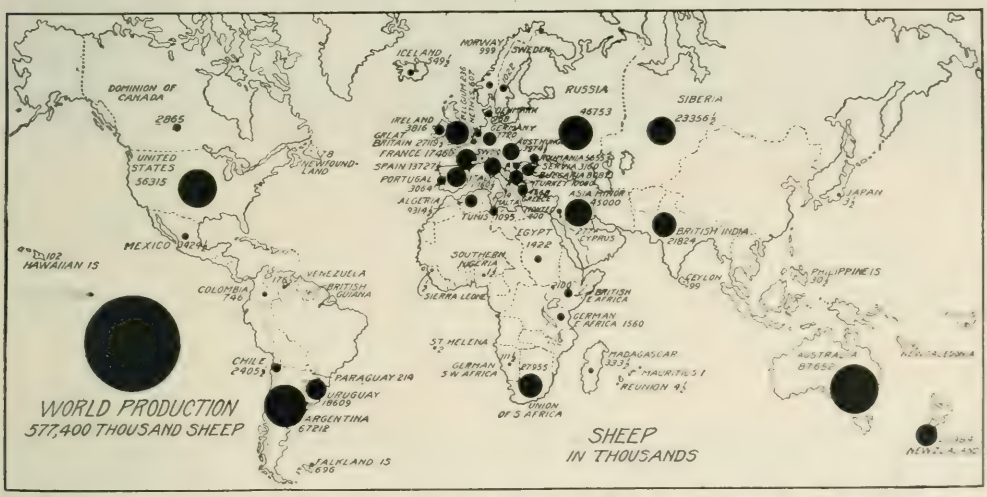


America, of course, invented the tobacco business. She still produces nearly a third of the tobacco used in the world. But here British India is coming to the front with a large production. Look on the map and see.

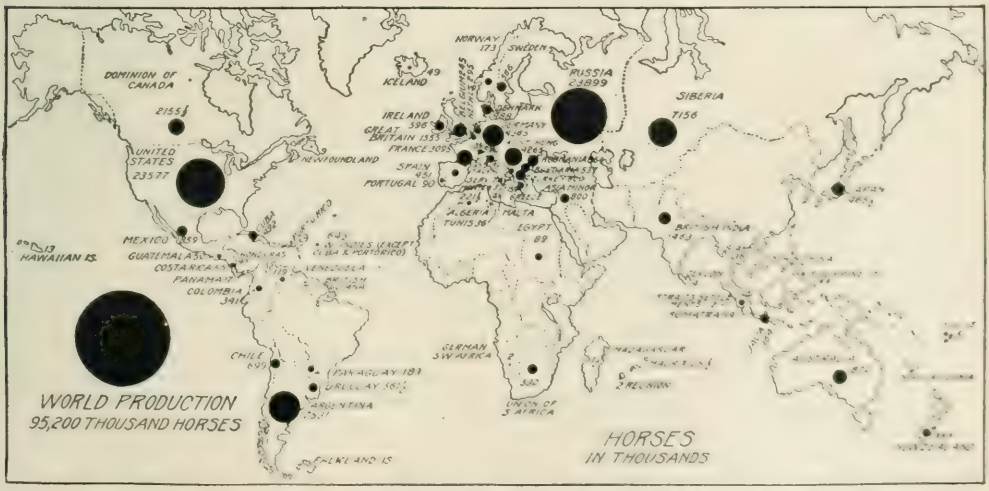
The hog roots in the ground, grunts in contentment, eats up the corn crop and furnishes the bacon to go with the eggs of the world's breakfast. Of this animal the United States produces nearly half of those grown the world around.



In cattle production only British India compares with the United States. But the cattle spots are widely distributed and it is interesting to note the size of those in Russia, Germany and Argentina.



But the sheep, friend of the patriarchs of old, is more widely distributed than any other animal. There are practically equal numbers of sheep produced in the United States, in Australia, in Argentina, in Russia, in Persia, in England.



There are but two big horse spots in the world. One is in the United States and the other is in Russia. Others are relatively unimportant.

NEGROES SEPARATING THE CHOCOLATE BEANS FROM THE HUSKS.
It doesn't take skilled labor for this.

WIDER FIELDS FOR CHOCOLATE

By RICHARD BENTON

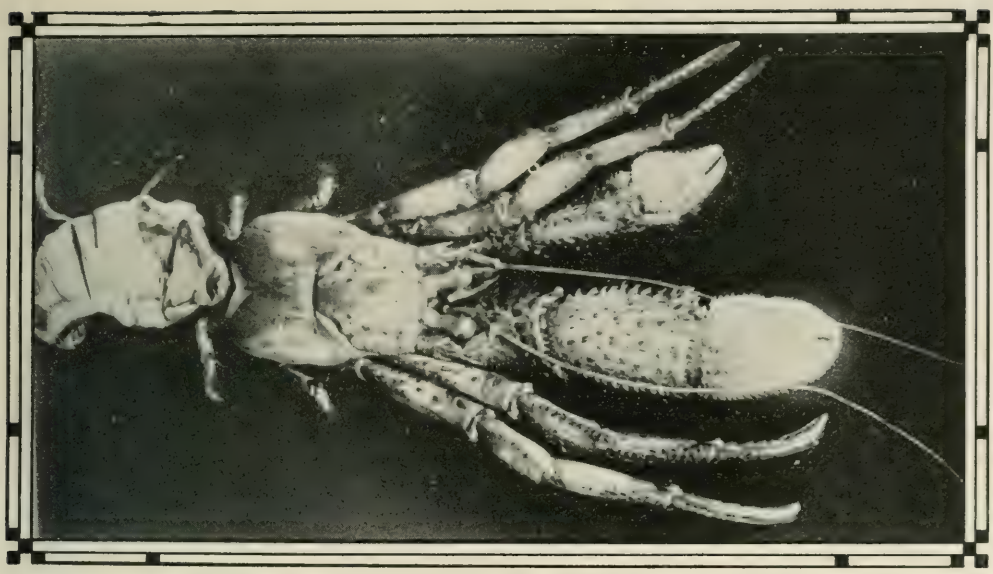
WE, in this country, are the greatest consumers of chocolate in the world. During a single year we imported over $15,000,000 worth of it—this value representing 129,854,749 pounds of crude beans, and 1,287,209 pounds of the prepared and manufactured article.

All over the world the demand for chocolate is steadily and rapidly increasing.

A single candy factory in New York City uses 100,000 pounds of cacao beans in a year. It usually keeps in stock as many as fifteen kinds of them—fine chocolates being prepared from mixtures of different sorts in carefully-adjusted proportions.

Necessarily, the immense demand for chocolate has brought about a corresponding extension of the culture of the tree, known as the "cacao," which produces it. Vast areas in various regions of the tropics are being planted with cacao orchards, and our own government, not content to encourage to the utmost the industry in the Philippine Islands, has introduced it in Porto Rico, and is now making preliminary experiments with the same end in view in the Hawaiian archipelago.

Commercial cocoa is exactly the same thing as chocolate, without any sugar, and with two-thirds of the fat—or oil—removed from it by pressure. This fat is the familiar "cocoa butter," which has largely taken the place of the old-fashioned cold cream as a remedy for sunburned noses and chapped hands. From the press the cocoa comes out in the form of dry cakes, and these are reduced to powder, which is poured by automatic machinery into cans, and sealed and labeled all ready for the market.



A HERMIT CRAB DEPRIVED OF HIS SHELL—A MISFORTUNE WHICH REDUCES HIM TO DEFENSELESSNESS.

WHERE FISHES CLIMB TREES

By

RENÈ BACHE

An account of this island—which belongs to the Dutch East Indies—is given by Mr. David G. Fairchild, who has charge of the government office of plant introduction, at Washington. He visited it not long ago with Mr. Barbour Lathrop, a well-known citizen of Chicago, and took the photograph, shown herewith, of one of the strange trees aforementioned. For this picture, as well as for an outline of the information on the general subject, the Technical World Magazine is indebted to the Volta Review—a publication printed at Washington, D. C., in the interest of the deaf.

IN far-off Eastern seas there is a wonderful isle, called Ceram, where the sea-beach is alive and crawls, where the trees have roots that grow in the air, and where the fishes come out of the ocean to climb the trees of the jungle along shore.

This is not a fairy story. The photograph herewith illustrates almost the first actual object that met the eyes of David G. Fairchild of the United States Agricultural Department upon landing in this strange place, on a recent visit there. It shows a species of fig tree whose roots start out of its trunk at a distance of eight to ten feet above the ground, and then grow downward to meet the marshy soil in the form of flying buttresses. These trees are fifty to sixty feet in height; their leaves look like the leaves of the rubber plant, and their juice is milky white like that of the milkweed.

"This tree," says Mr. Fairchild, "grows so near the seashore that a species of climbing fish crawls up the roots, sometimes to a distance of thirty or forty feet. When we landed on the island, there were hundreds of these fish jumping around on the sand and climbing the roots of such trees as this, hunting for insects."

But this was by no means all. A greater marvel was still to come. Mr. Fairchild goes on to say:

"As we set foot on this coast of wonders, I turned in amazement to my companion, and said, 'Why, Mr. Lathrop, the

Tropical Fig Tree with Aerial Roots, Photographed on the Island of Ceram.

sea-beach is running away!' It is no exaggeration to say that the beach was alive with hermit crabs. They seemed as numerous as the sands of the sea, and were of about the same color. Their shells ranged in size from a pin's head to that of a horse chestnut, and they were in constant motion, thousands upon thousands of them, crawling up and down the blades of grass, and swarming over the trunks of the trees along the edge of the jungle.

"The moving sands, with a background of trees whose roots were apparently all above ground, and which were covered by tree-climbing fish, formed the most fantastic picture that it has ever been my fortune to look upon."

By great good luck, Mr. Fairchild's photographs came out in excellent shape. Satisfactory pictures are rarely obtained in the tropical jungle, owing to the fact that the moist and miasmatic atmosphere is likely to ruin the films.

As for the fish in question, it is known to science as Periophthalmus, of the family of the gobies, and is one of the curiosities of nature. Its expanded ventral fins serve the purpose of feet, enabling the creature to walk, with the help of the highly developed pectoral fins—the latter being utilized as arms. The fish, of course, lives in water, but its gill openings are so small as to conserve the supply of moisture, the gills being kept wet, and the animal is thus enabled to stay for quite a while out of its native element.

The creatures are of a dully slaty color, about nine inches long when full grown, and remarkably active—progressing on land by short but rapidly repeated jumps. This they manage by bending the hinder third of the body sharply around to the left, then straightening it very suddenly, and at the same instant lifting the front half of the body clear of the ground by means of the armlike pectoral fins, which act like the front flippers of a sea lion. These fins, indeed, are very like arms in structure and use, the bones being of great length.

Fishes of this strange species were seen and described not long ago by Mr. William T. Hornaday, a famous naturalist, who is now superintendent of the Zoölogical Garden in New York. In his very fascinating book, called "Two Years in the Jungle," he says that the creatures, when he caught sight of them, were hopping about on a mud flat.

"Although apparently stranded," he writes, "they seemed perfectly at home, and went jumping around over the mud in every direction with the greatest indifference to their sudden change of element. In reality they were feeding on tiny crustaceans left on the bank by the receding tide. When I tried to beguile my Malay boatmen into catching some specimens for me, they declared it impossible, on account of the depth of the mud and the swiftness of the fish."

The Fishes that Hop on Land and Climb Trees.

HERMIT CRABS—OCCUPYING THE SHELLS OF OTHER SPECIES OF MOLLUSK.

But Mr. Hornaday is not known as one of the greatest living natural history collectors for nothing. He wanted at least one or two of those remarkable fishes, and by hook or crook he meant to get them.

"They (the Malays) were thunderstruck," he goes on to say, "when I pulled off my shoes and told them to put me ashore. Seeing that I was really going, my young man Francis, like a good boy, did not hesitate to follow, and we stepped out of the sampan into mud and water hip deep.

"We sank into the mud to our knees at every step. Bidding Francis choose the largest fish, we went for them. There were probably a dozen in sight, hopping spasmodically about, or lying at rest on the mud, but when we selected the nearest large specimens and made for them, they developed surprising energy and speed, and made straight for their burrows. Owing to the soft and yielding nature of the mud, their leaps were short, about six inches being the distance gained each time, but they were so rapid, the mud so very deep, and our progress so slow, that they always succeeded in getting into their holes before we could reach them.

"Their burrows were simply mud holes, going straight down to a depth of three or four feet, but large enough in diameter to admit a man's arm easily, and of course full of water.

"Although the mud was soft, it was not sticky, and we were able to use our hands for spades very effectively. By digging a big hole two feet deep, and standing on one's head in the bottom of it, we were able to reach an arm down two feet farther and seize our fish at the bottom of the burrow.

"My first fish was hard to get, and hard to hold, but, in the immortal words of 'The Shaughraun,' 'begorra, 'twas worth it.'"

But Dr. Hornaday's troubles were by no means over yet. Continuing his story, he says:

"As I remarked before, our living specimens were hard to hold. When I was trying to pass a string through the gills of my first fish, he struggled out of my grasp, and the moment he touched the mud, started at his best speed for the water, twenty yards distant.

"I was horrified at the thought of his getting away, and, falling upon my hands and knees, I pursued him frantically on all fours. My stolid and ever-respectful Malays actually shouted with laughter to see the master go over the mud like crocodile. However, I overhauled my fish in fine style. A few minutes later I saw Francis execute the same brilliant maneuver, for the same cause, and it certainly was a most laughable spectacle.

"We got seven fine specimens altogether, and of all the muddy beings you ever saw—but I will draw the veil."

The island of Ceram, by the way, where the sea-beach is "alive," and the Periophthalmus fishes climb trees, is inhabited, Mr. Fairchild says, by Malays and "a handful of Dutch."

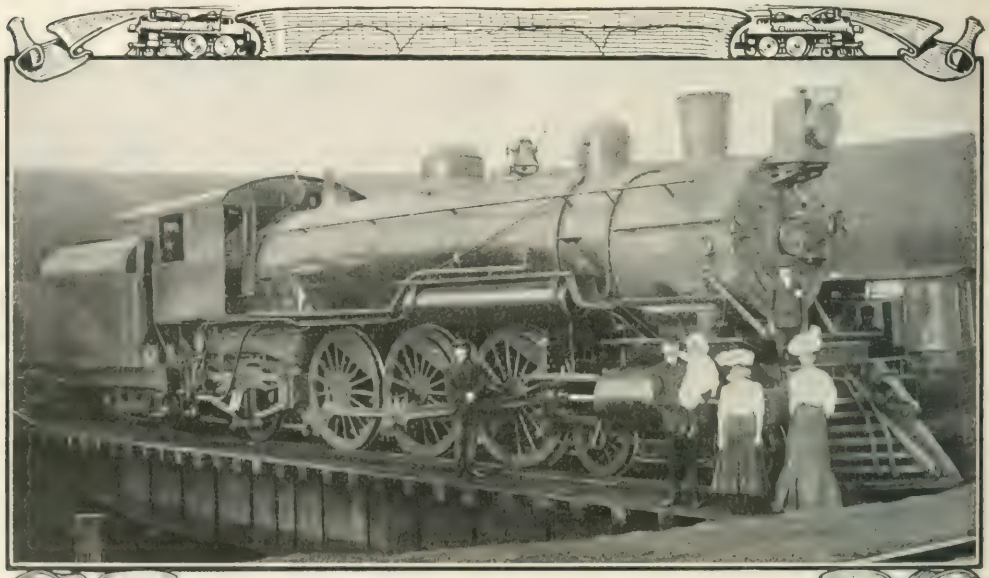
THE SLEUTH ON THE FAST EXPRESS

By

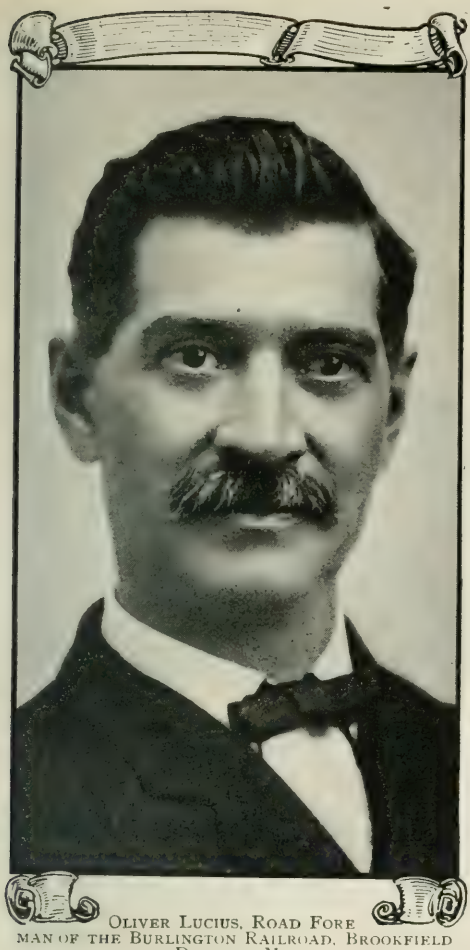
EDGAR WHITE

THE rural constable, with chin whiskers and big tin star, is not the only eagle-eye on the lookout for scorchers these days. There's a silent, less conspicuous watcher quietly roosting upon the cylinder of the gigantic machines that nightly haul ten heavy coaches through the Missouri cornfields, across the Illinois prairies and into Chicago by way of the Burlington system. The terror of the auto scorchers generally goes to sleep when he feels like it, so there is an interim of peace, but the little monitor in front of the great black engine never gets weary. In the one case the derelict humbly follows the chin whiskers, tin star and club before the police court, and there explains that by no possible means could he have been running more than two miles an hour, in full respect to the town ordinance. In the other case there is no explaining when the "defendant" is confronted by the accusing tape, which shows that on such and such a tangent, or around a certain curve, he was swinging along at a greater rate than fifty miles per hour.

Some years ago, before the road put its little detective on watch, the writer enjoyed the thrilling experience of riding westward from Chicago on the head-end with a friend who was something of a scorcher when conditions were right. The engine was a balanced compound with four seventy-eight-inch drivers. This machine could handle eleven or twelve passenger coaches all right on the level, but the load was too great on heavy grades. In consequence the en-



ONE OF THE MAMMOTH LOCOMOTIVES THAT TEMPT THE ENGINEER TO GO BEYOND THE SPEED LIMIT.
Used on the Chicago-Missouri Limited between Brookfield, Mo., and Galesburg, Ill.

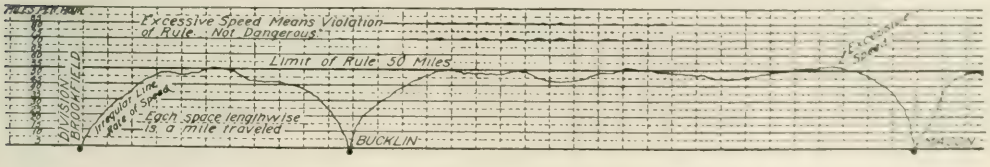


OLIVER LUCIUS, ROAD FOREMAN OF THE BURLINGTON RAILROAD, BROOKFIELD DIVISION, MO.

gineman, in order to hit the card right, had to do some lively hustling on the level, and down hill. On this occasion, after crossing the Mississippi and striking some solid rock ballast, the driver "let her go." By figuring on the white mile posts sweeping by it was ascertained the train was making the rise of eighty miles an hour, not a dangerous rate on a straight track, but it was held to on curves for a long distance. The tall engine careened as it hit the curve and the cab oscillated from side to side as though it might, with a little encouragement, jump out on the right-of-way. The roar of the engine at that speed was deafening; everything about it seemed to be popping off, or making some sort of noise; far ahead in the gloom of the boiler the bell clanged like a hammer striking an anvil, while the short stack abaft the electric headlight spouted fire.

To reduce the liability of accidents from excessive running it was decided to change the motive power. A Pacific type of engine, known on the Burlington system as Class S-1, was adopted. This is a simple engine with six seventy-two-inch drivers, four small wheels forward and a trailer under the cab. The S-1 was so powerful that it could maintain its speed, with the Chicago-Missouri Limited of ten or twelve coaches, up grade, around curves or anywhere you put it. This removed the necessity of excessively fast running on the level and down gentle declines. The next move was to put a check on "sprinting" engines. It was decreed that the rate should not exceed fifty miles per hour under any circumstances. According to the card the east-bound Limited, No. 56, averages 36.2 miles per hour across Missouri. The west-bound, No. 55, averages 35.6. This takes no account of station stops, which means the speed while running must be considerably greater than the figures given.

"The object of the speed indicator," explained Mr. Oliver Lucius, road foreman of the Brookfield division, "is to insure a greater uniformity of speed. It is safer, and much more pleasant for the passengers. These big engines were put on for that very purpose. With a smaller


Excessive Speed Means Violation of Rule. Not Dangerous.
Limit of Rule 50 Miles
Each space lengthwise is a mile traveled
BROOKFIELD DIVISION
BUCKLIN

THE CHART WHICH MAKES A SILENT RECORD OF AN ENGINEER'S ADHERENCE TO OR VIOLATION OF THE COMPANY'S RULES.

ONE OF THE FAST TRAINS THAT IS EQUIPPED WITH THE SPEED INDICATOR.

engine you lose on grades and have to run faster at other places to catch up. It was carefully figured that no engineman on this division need exceed fifty miles an hour to hit the schedule. The curves, bridges and every department of the track are constructed so as easily to stand that sort of running with the heaviest engines and trains.

"At first the enginemen didn't like the idea of having a tally kept on every mile they run; said they knew how to handle their engines to the best advantage so as to make the card. But they're getting so they rather like the innovation. You see the recorder has connection with a gauge in the cab by which the engineer can tell at any time exactly how fast he is running. The small wheel on the recorder, which is connected with the forward wheel of the truck, makes six hundred revolutions in a mile. While measuring the distance traveled it also gives the rate of speed at which each mile was run, registering the observance of slow orders and all stops.

"The engineman has the record right in front of him, and knows exactly where to set his lever to maintain his speed. There is no guesswork about it.

"The locomotives now hauling the Limited into and out of Chicago and Kansas City will handle a ten-coach train on the level, fifty miles per hour, working only six inches of steam, and using the balance of the stroke expansively. They can, if necessary, make eighty miles an hour with an ordinary train, but that sort of running is in violation of the rules."

Here a veteran engineer, who was standing by, spoke up:

"The other night we had a lot of baggage at Bucklin and were held there seven minutes and a little farther down the line we lost three minutes. That put us ten minutes to the bad, and when I got to Shelbina, there was a message from the dispatcher wanting to know whether I had gone to sleep. Now, I had been running up to the limit, and could easily have caught that ten minutes by going beyond it, but there was your little spotter on the front end."

"You got your train in at the terminal on time," replied the road foreman, "and I guess that ten minutes loss at a few stations in Missouri didn't hurt. You did right in respecting the rate limit."

The night following the talk with the road foreman the writer went east in the cab of the Limited to observe the difference in operation since the recorder system was put in use. Class S-1 is "all engine." It weighs 214,000 pounds, without the tender. The huge boiler extends quite through the cab, leaving barely space for fireman and engineer. To the layman it looks as if the cab, large as it is, is entirely filled by the boiler and the vast network of machinery belonging to the operation. Wherever there is a gauge or anything the engineer must see readily, there is a shaded electric light, illuminating only such parts as are essential. The balance, save when the great furnace door is open, is in blackness. One could not help but think how very slight were the chances for the men in the cab to get away in case of collision or derailment.

"The big engine of the middle division, which had been standing in the yards, black and ponderous, was slowly moved down and coupled on to the long line of lighted cars which has just been brought in from Kansas City by its twin. The conductor walked up to the gangway, and said:

"All right, Felix."

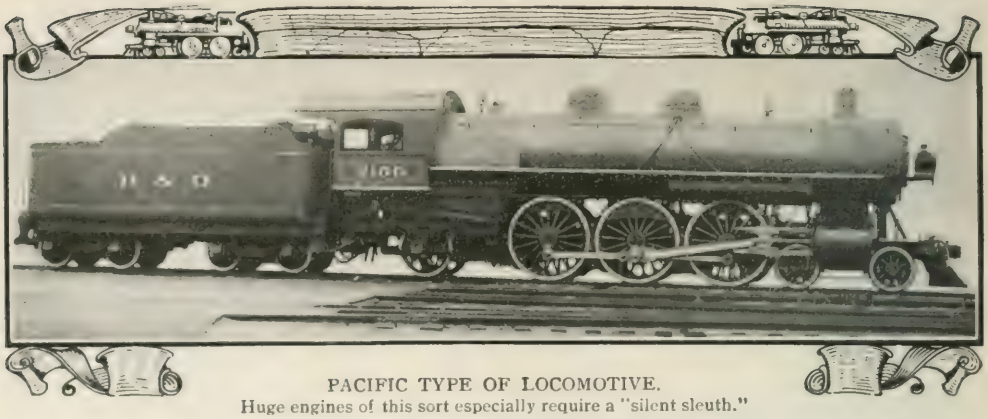
"Aye, aye, sir," replied the engineer.

The automatic valve was opened and the bell, midway of the boiler, began to clang harshly. From the cylinders great billows of white steam floated out into the yards, rolling about like clouds under the arc lights.

The train started without a jerk, but vigorously. In two minutes it had swept through the yards, the engine giving the legal warning at all the crossings, and was clear of the town. The searchlight swept the track far ahead, bringing into clear relief the heavy rails, the ties and

THE "BLOCK" SYSTEM IS ANOTHER MEANS OF PROTECTING THE PASSENGERS.

The "home" signal on right rises to danger—"stop," when locomotive passes, and so remains until the train is clear of the block it is entering.



PACIFIC TYPE OF LOCOMOTIVE.
Huge engines of this sort especially require a "silent sleuth."

the rock-ballast, and showing, well-defined, the green growth on the right-of-way.

Out in the open, a clear track ahead, the engine, like a faithful draft horse, settled down to work, steadily, panting hard, as if begging for full release. With the lever only half way across the gauge, the train was rushing along at the limit of the rule. It didn't appear to be going overly fast until it struck a long curve, down grade. Then the engine quivered, and the cab seemed to jump from side to side. As it careened over to conform with the depression of the inner rail, the great boiler looked dangerously high and heavy, and the chances of turning over seemed very near.

With the train rushing along to the limit; and with a world of rods, gauges, levers, indicators and valves before him, the engineer did not seem to be worried. He stood in the right hand corner of the cab, his goggles above his eyes, seeing everything, but apparently indifferent.

"This speed indicator business is a sort of fad," he said; "it might do all right for some youngsters just starting in to sorter hold 'em down, but when a man's run an engine ten or fifteen years, he knows how to get over the road without any diagram. See that red light ahead? That means stop. But we aren't going to stop. In a minute it will be changed to white—see—he's changed it. That gives us the right-of-way. If he hadn't changed it before we got there we'd had to stop. You see it gives us two signals, and makes it doubly safe."

The engine reeled on the miles with a steady, even motion, as if set to a mark. At every stop the train was exactly on the card, and yet at no time, except when rounding curves, did it appear to go fast. The hard part of the job seemed to be on the muscular young fireman, who constantly toiled on the iron deck below, amid the red glare sweeping out of the furnace door. The steam, set to blow off at two hundred, shot out of the safety valve now and then.

Missouri extended a majestic farewell. The searchlight played on the tall crags south of the line, revealing curious nooks and crannies, sombre coffin rocks jutting out here and there, owl dens and robber caves, all rushing by in the uncanny glow like a weird picture show.

The Mississippi, running low, half shorn of its grandeur, sand bars encroaching from the shores, is spanned by a mile-wide steel bridge, across which the Limited rolls smoothly and steadily. A long vibrating blast from the bronze throat aloft and a minute later the train is at the long station, the center of a rushing throng of passengers, busy train men, and jostling baggage, mail and express trucks.

"Remember," said Felix, as his passenger climbed down from the cab. "I'm not kicking at that thing out there; if they want it it's all right with me, but what's the use of going to all that trouble and expense? If they don't want us to run faster than fifty miles an hour all they got to do is to say so and we won't."

POISON IN THE BROWNTAIL

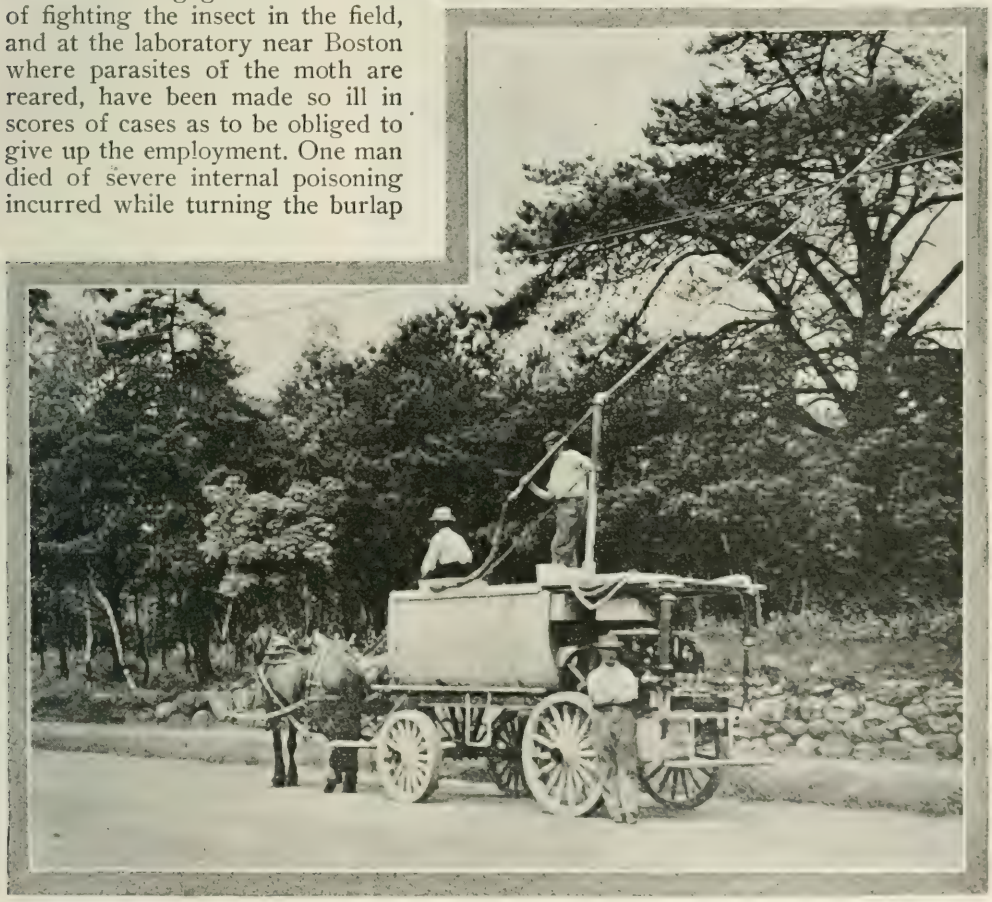
By

ROBERT FRANKLIN

THE mystery of the poisoning of many thousands of people by the caterpillars of the browntail moth, in Massachusetts and other parts of New England, has at last been solved by scientific investigation.

No small importance attaches to the matter, inasmuch as the poisoning in numerous instances has been very serious. Men engaged in the work of fighting the insect in the field, and at the laboratory near Boston where parasites of the moth are reared, have been made so ill in scores of cases as to be obliged to give up the employment. One man died of severe internal poisoning incurred while turning the burlap girdles placed on trees for protective purposes.

Large numbers of people in that part of the country are troubled every year with what is called "browntail rash," and there has been much complaint on this account. Exceptionally severe cases of this rash have occurred when housewives have swept the caterpillars from their porches, or brushed down the co-



MACHINE SPECIALLY BUILT FOR SPRAYING MOTH-INFESTED TREES WITH LEAD ARSENATE.

coons, which are interlaced with caterpillar hairs. Such hairs, more or less broken, float about in the air when the webs or cocoons are disturbed, and, if inhaled, cause a great deal of internal irritation and actual poisoning.

Now, it has been supposed hitherto that the rash or more serious poisoning was caused by the mechanical irritation of the caterpillar hairs, which are barbed throughout their length. But a recent study of the subject has shown that, while this has a good deal to do with the matter, the trouble is chiefly due to a chemical poison contained in the hairs. This substance acts directly upon the red corpuscles of the blood, breaking them down to a certain extent, and causing their normally circular disks to assume a jagged outline.

Speaking of this matter in a forthcoming bulletin of the Department of Agriculture, Dr. L. O. Howard says that such a multitude of people have suffered from this form of poisoning that many remedies, warranted to give relief, are prepared and sold in New England. Some of them are fairly good, but none of them is entirely satisfactory. Applications which are cooling to the skin, such as witchhazel, or alcohol, are helpful to some extent. The trouble is more serious in hot weather, when the pores are open, the skin at this season offering less resistance to the entrance of the spines. But the internal irritation caused by breathing or swallowing the poisonous hairs is often serious and even dangerous, and no really effective remedy for it has been found.

In the work of fighting the pestiferous gypsy moth, "tanglefoot" is now being used in New England for banding the trees, instead of burlap, because of the serious poisoning of men employed in turning the burlap bands. Many of the browntail caterpillars seek hiding places in the burlaps when about to spin their cocoons, and hence the trouble, from which hundreds of employees have suffered extremely every season. In numerous cases efficient and well-trained workers have been obliged to resign.

The browntail moths are themselves provided with barbed hairs, though to a less extent than the caterpillars, and cases of poisoning have been reported during their flights in the summer time. People have been advised not to put underclothes and bedding out on the line during the caterpillar season, inasmuch as floating hairs may alight upon such articles and, when brought into close contact with the person, give rise to much mischief.

A Swarm of the Browntail Pest on an Electric Light Pole.

This is an affair of importance to people all over the United States, because it is only a question of time when the browntail and that other dreaded mischief-maker, the gypsy moth, will find their way out of New England and into other sections of the country. It will then be a question of continuous and highly expensive warfare by the individual states, under the general direction of the Federal government. For, while the browntail is a nuisance nothing short of insufferable, the caterpillar of the gypsy moth is a wholesale devastator. If allowed to multiply unchecked, it will literally transform the most fertile area into a desert, destroying all the trees, eating all the crops, and devouring everything that is green and growing.

Fortunately, the female gypsy moth is not able to get about from place to place, unless carried. The insect depends for transportation and distribution, therefore, upon accidental conveyance by vehicles or persons. Touring motor cars are largely responsible for

scattering the caterpillars far and wide, and milk and other delivery wagons accomplish much in the same unhappy direction. With the browntail, however, the case is different. Both male and female are strong flyers, and thus are able rapidly to extend the territory which they occupy.

At the present time about $1,000,000 per annum is being spent in New England in fighting the browntail and gypsy moths. Much of the work consists in spraying trees with a solution of arsenate of lead, which has been found so effective when used in this way as to supersede all other poisons for the killing of leaf-eating insects of all kinds. During one season alone nearly five hundred tons of lead arsenate were used for spraying trees in New England, the most effective work being accomplished with newly-invented and very powerful machines.

Latest Method of Fighting the Browntail Moth, an Insect That Has Poisoned Thousands of People.

These high-power spraying outfits throw solid streams high into the air, where they are broken into a mist. The most successful machine of this type thus far designed is provided with a multiple-cylinder pump, which is connected by a clutch with a ten horse-power gasoline engine of the marine or auto type. The pump is capable of delivering thirty-five gallons a minute, and its piping is so arranged that water may be drawn into a tank from any accessible well, pond, or stream.

The machinery is mounted upon the back part of a wagon truck, the front of which is occupied by a five hundred-gallon tank. When such a contrivance is used, and the pressure is held at two hundred to two hundred and fifty pounds, trees from sixty to seventy-five feet high can be thoroughly sprayed from the ground. Inside the tank is an arrangement of three two-bladed propellers, connected with the engine by gears, which keeps the poison and water thoroughly mixed.

Hopes are entertained that some fungus diseases may yet be employed with success in fighting these abominable insects. During a recent summer millions of browntail caterpillars were destroyed in Massachusetts by a fungus

which was identified by Dr. George E. Stone, botanist of the Agricultural College of the State, as Empusa aulicæ. This disease has been found also in New Hampshire and Maine, attacking both the small caterpillars in the webs and the larger ones which feed during the early part of the season. It has undoubtedly assisted in checking the increase of the browntail moth—though, unfortunately, its development and spread depend largely upon weather conditions. In some years it seems to do the insects very little damage.

Another fungus disease, known as "fletcherie," which has proved very fatal to silkworms, and therefore a cause of much loss in the silk-producing industry, now turns up in a highly beneficial aspect as a malady attacking the caterpillars of the gypsy moth. It is accountable for what is popularly known as the "wilt," or "caterpillar cholera," which has been disastrous to the gypsy moths in some sections of New England, and especially in the worst infested areas. The caterpillars assailed by this trouble become sluggish and soon die, the insides of their bodies turning semi-liquid and putrid. Where the "cholera" is particularly prevalent, oftentimes the trunks of trees below the "tanglefoot" or burlap bands are almost completely covered with dead or dying caterpillars.

Both of the diseases above mentioned are being carefully studied by specialists of Harvard University, and much hope is entertained of the "cholera," which, though hardly noticed at all until within the last half dozen years, seems to be steadily spreading and gaining in destructiveness.

Mignon Aspiring to Heaven

Such let me seem till such I be;
Take not my snow-white robe away,
Soon from the dreary earth I flee,
Up to the glittering realms of day.

There first a little space I 'll rest,
Then ope my eyes with joyful mind,
In robes of lawn no longer dressed,
Girdle and garland left behind.

And those calm, shining sons of morn,
They ask not touching maid or boy;
No robes, no garments there are worn;
The frame is purged from sin's alloy.

Through life, 't is true, I have not toiled;
Yet anguish long my heart has wrung,
Untimely woe my cheek has spoiled:
Make me again forever young.

—Goethe.

THE GRAND CALUMET CANAL THROUGH WHICH THE RIVER OF THE SAME NAME HAS BEEN DIVERTED.

MOVING A RIVER

By

ROY O. RANDALL

MANY wonderful things have been done at Gary, Indiana, as all magazine readers know, but one of the most interesting feats accomplished there, which heretofore has attained little publicity, was that of the civil engineer who picked up a two mile stretch of the Grand Calumet River and set it down one-half mile south of its old channel.

Figuratively this is what the engineer did. In more practical phrase he obtained the assistance of an excavating contractor and, digging a new channel, diverted the Grand Calumet from its ancient and tortuous way.

The demands of great commercial interests usually are responsible for what nature lovers frequently term "disfigurement of the face of Nature," and the Gary project is no exception. When the great plant of the Indiana Steel Company still was in the blueprint stage it was apparent to the promoters of the vast enterprise that the Grand Calumet River would prove an impediment to their plans. A ten mile strip of Lake Michigan shore land had been bought by the United States Steel Corporation and upon this large tract were to rise the steel mills and other structures of the Indiana Steel Company, besides numerous other plants of subsidiary companies. At a point two miles east of that portion of the steel company's holdings upon which stands its central plant entered the Grand Calumet, which, flowing sluggishly westward, divided the strip in half. Its course about midway was marked by a languid double turn whence it proceeded southwesterly, eventually

THE OLD RIVER CHANNEL BLOCKED BY THE INDIANA STEEL COMPANY'S IMPROVEMENTS.

clearing the steel company's building tract at a point due north of Gary's business section.

The problem was to divert the river from its original course through that section of the company's land allotted to manufacturing plants and cause it to flow westward in a straight line to connect with its old channel south of the newly erected mills. The length of the artificial channel required to accomplish this was approximately two miles. Though not a navigable stream federal supervision of the project was required and a government permit was issued upon application by the steel company.

Work was begun in June, 1909, and by August 1 of the present year three-fourths of the canal had been finished. It was believed the ditch would be entirely completed before the end of 1910.

With all deference to those early optimists who were responsible for the christening of the Grand Calumet it must be admitted that the stream is not grand at all but on the contrary it is of a

THE CANAL AND A "DEAD END" OF THE OLD RIVER CHANNEL.

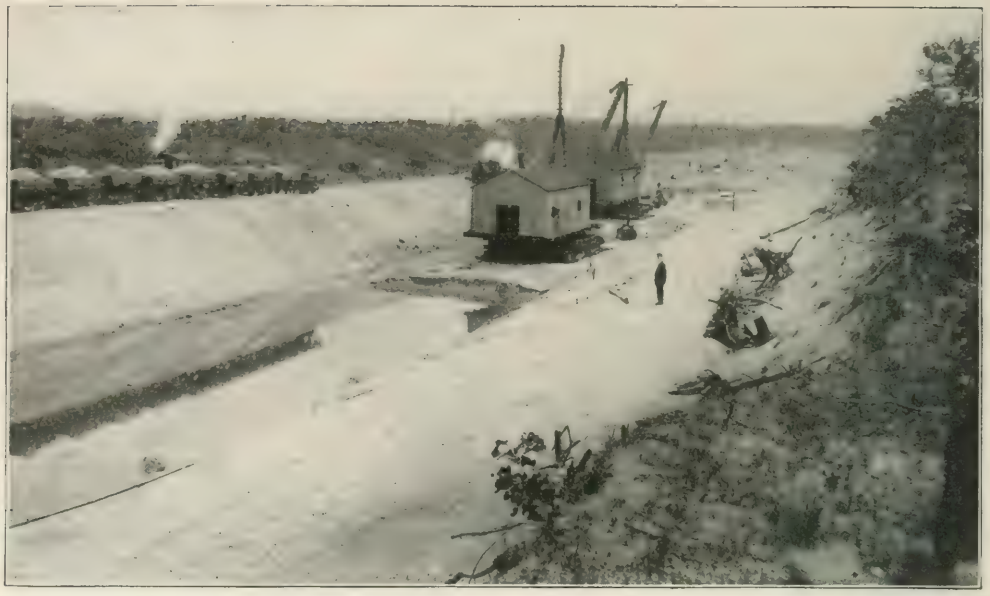
simple, unassuming nature, turbid in its flow and of an average depth not to exceed five or six feet. At one time the river may have possessed some grand characteristics as the old bed of the stream, shown in an accompanying photograph, lying north of the canal which now supplants it, is of considerable width, probably five or six hundred feet. The greater part of this old bed at present is merely a treacherous, though

A SECTION OF THE CANAL BETWEEN EMBANKMENTS TAKEN FROM ITS OWN BED

picturesque, swamp, with a shallow stream in its center, adorned with lily pads and high, waving grass. With the completion of the substitute ditch the old channel will be filled up. On its site will arise other of the immense manufacturing institutions that now are moving on Gary in ever increasing numbers and which bid fair to make the town a second Pittsburg within the present generation. Already the coke ovens and other structures of the steel company occupy a considerable part of the old Grand Calumet channel—probably more than half of that section of the river which has been diverted from its former course.

The canal, when completed, extending eastward from the Broadway bridge in Gary to where it joins the Grand Calumet, will have a channel of from forty to fifty feet in width, ten feet in depth and will be constructed with a view to possible future use as a navigable stream from Gary to some point south of Chicago. It has been suggested that from Wolf Lake, the present emptying point of the Grand Calumet, the stream might be carried farther to connect with other projected waterways via the Illinois River and become another link or feeder in the Great Lakes to the Gulf Deep Waterway. This is in no immediate contemplation by those having the river moving project in charge as the change in its course was undertaken simply to provide suitable unbroken space for the buildings of the steel corporation and its subsidiary companies. If in the future a ship canal should be constructed from this port it appears probable that the Gary end of the canal would begin at the artificial inlet from Lake Michigan, already constructed by the steel company, and utilized at this time for the docking of deep draft ore-carrying steamers.

Little engineering difficulty has been experienced in excavating the new channel for the Grand Calumet as the

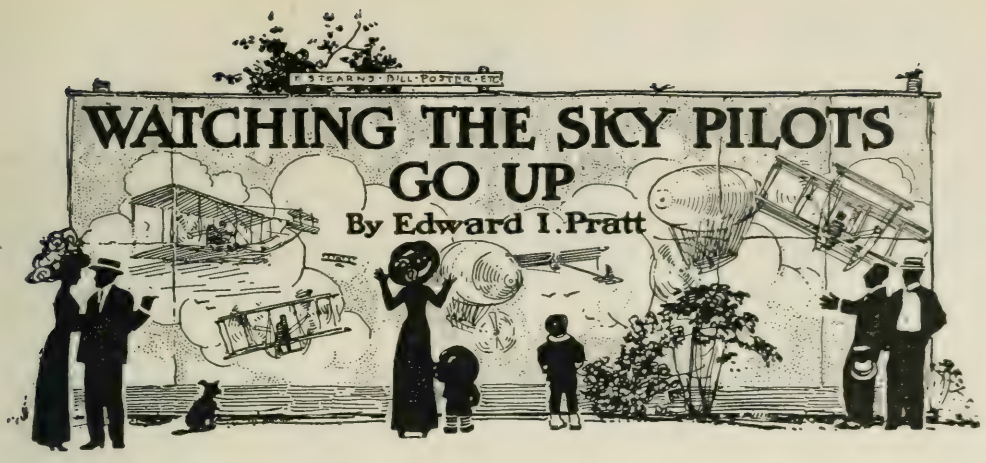


SAND DREDGE AT WORK; THE TEMPORARY RAILROAD; SAND DESERT; AND SCRUB OAKS PRIMEVAL.

digging, in the main, has been through sand or sandy loam. The trouble has been to maintain the channel as already dug. Further dredging will be required in that part of the canal upon which work was done several months ago. No adequate provision has been made, save in a few instances, to prevent the sandy banks from washing and blowing down into the canal, with the result that these natural accretions have narrowed the channel. It is likely that following the second excavation heavy material, such as bricks, slag or cinders will be dumped along the sides of the canal to retain the sand walls in position.

While the force of men employed in digging the Grand Calumet ditch is small, the methods used in excavating are, of course, similar to those required in projects of greater magnitude. A miniature railroad has been built along the line of the canal and the dump cars with which it is equipped receive the excavated material direct from the steam shovels. The accompanying photograph discloses the excavating apparatus and a loaded train. From the ditch the sand is transported to the old river channel where it is deposited. The work throughout has been of a simple character though of considerable extent as the cut for the greater part of the way has been through a ridge thirty to forty feet high. The cost of the Grand Calumet canal will approximate half a million dollars.

An incident of interest was related by the contractor in charge of the work. At a distance of thirty feet underground, or more accurately, under sand, a massive tree-trunk was exhumed. Speculation as to the age of the tree, and the number of years or centuries the sand has been drifting over it and concealing it from human sight, has proved a fruitful local topic for argument and discussion.



WATCHING THE SKY PILOTS GO UP

By Edward I. Pratt

POSTERS around town announce wonderful aeroplane exhibition at Speedie Race Track. Posters show aeroplanes circling hundreds of feet over vast throngs; aeroplanes racing; aeroplanes soaring. "Let's go John," says wifey. We start. Hop on street car. Many others doing same thing. We near the race track at 2 P. M. August sun, cloudless sky. "What's that crowd over at other end of park," asks Maria. "O, they're waiting for the aeroplane to go up," I conjecture.

The band begins to play. People crowd around expectantly. We hurry to opposite side of park. Find a man tinkering with a motor cycle! Time, 2:45 P. M. "O, look at all those people over by the grandstand, the machine's going up now, hurry!" We hurry, across track, under fences, over muddy and dusty fields. Ever cross a muddy and dusty field in a hurry? We reach grandstand. So do several thousand others. "He's going to start," says Maria firmly. A thousand people jam around an aeroplane—at last.

Three men tinkering with it. Time, 3:15 P. M. Loud shouting. Stout policemen beat people back with clubs. "Clear out of here!" they bellow. We clear out. So do others—near policemen.

"Now he's going up," repeats Maria, cheerily. Wife and I, along with the multitude, jostle each other against the race track fence. Hot? An August sun is at its best over a crowd. Much mopping of brows. You can almost fry eggs on that top fence rail. A great shout! "It's moving!!" is the cry. Maria and I leave fence. So do several thousand others. Policemen helpless. They shout more commands and wave clubs hopelessly. Maria says she heard one swear.

Flytis sits in the machine. Four perspiry men push it. One man still tinkers with the wires. The man-bird wobbles up and down over the uneven meadow. People rush from grandstand. Thousands scatter over field. All seem to get in the way. Flytis looks dubiously up at flag on grandstand; fluttering in a summer zephyr. They stop. The man that was tinkering, moistens his finger and holds it up in the air. The officials hold consultation. They turn the machine around. Time, 5:16 P. M.

A few start to go home. At last someone cranks engine. "Now he is going up," says Maria, "but it's most supper time." "Wait a few minutes more," I coax. "Hurrah! There it GOES!!!" Did you ever hear an aeroplane getting under way? If you shut your eyes it sounds as though some one was steering a motor boat through a mirage. Cheers from the crowd. He's off—at last. Engine stops. A few convulsive turns of propeller — chug-chug-chug! It stops again.

"O, look, there's a dirigible coming out of a barn over there," calls Maria, excitedly. Everybody turns. Sure enough. A few thousand, including Maria and I, start for the dirigible, half a mile away.

"What time is it?" gasps my Better Half, as we struggle in the jam, "six seventeen? Oh, we must go home this minute." We approach the air ship. Forty men hold it down with a myriad

of ropes. The huge bag sways overhead like a captive whale of the air.

Scarewind, the aeronaut, walks ahead, leading dirigible by rope. "I guess he's going up, anyway," I venture. "Gracious," says Maria, ignoring my remark, as we lean, exhausted, against the fence. "We must leave this minute, or no supper." Further argument fails me. We begin to go. Push through confused masses of humanity.

Scarewind continues to lead dirigible up and down before grandstand. Forty men still hold it down.

Across the field, the aeroplane is motionless. Sounds of hammering indicate further tinkering. The flag droops waveless against the pole. Many others going home.. Some look weary. Some look mad. All look hungry. At last we reach the gate and struggle onto a street car already jammed three times its guaranteed capacity. "How hot and messy everything is," says Maria.

Ding! Ding! Buzzzzzz! "The car goes anyway," mutters an adjacent strap hanger. As we turn the corner where we first caught a glimpse of Speedie track, all crane necks. "Look at that crowd of people across the field," I suggest wearily as sounds of far off cheering are heard above the grind of the street car. "Yes," says Maria, with that tired smile, "I believe he's going up."

LOOKING NORTH ALONG THE LIVINGSTON CHANNEL IN THE LOWER DETROIT RIVER.
Here are shown the 22-foot excavation, cableways, steam shovel and a 65-foot mountain of rock taken from the channel

PASSING OF THE HELL GATE OF THE LAKES

By

LEN G. SHAW

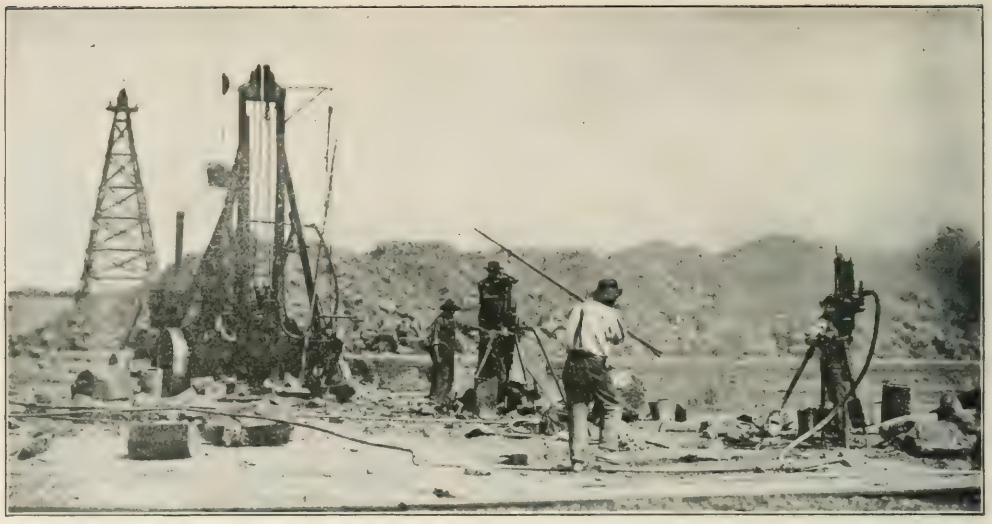
ONE blustry winter's day a group of vesselmen stood far out on the point of Stony Island, in the lower Detroit River, and gazed interestedly across the waste of ice spread out before them as one of their number, with much waving of arms, pointed out what it was proposed to do.

"That man Locher's a nervy fellow all right," said a weatherbeaten old vessel captain, rubbing his benumbed ears briskly, "but I'm telling you it can't be done. It's beyond all reason."

The rest of the party nodded a ready assent, and then hastily trekked back through the snow and over the ice to the mainland, convinced in their own minds that the man who proposed revolutionizing accepted methods of marine engineering would fail.

Nine months later the man whose plans had been jeered at stood on this same point, and with a smile of satisfaction on his bronzed face watched while giant pumps drew the last of the water from the river bed in an area one mile long and fifteen hundred feet wide, leaving the rocky bottom bare.

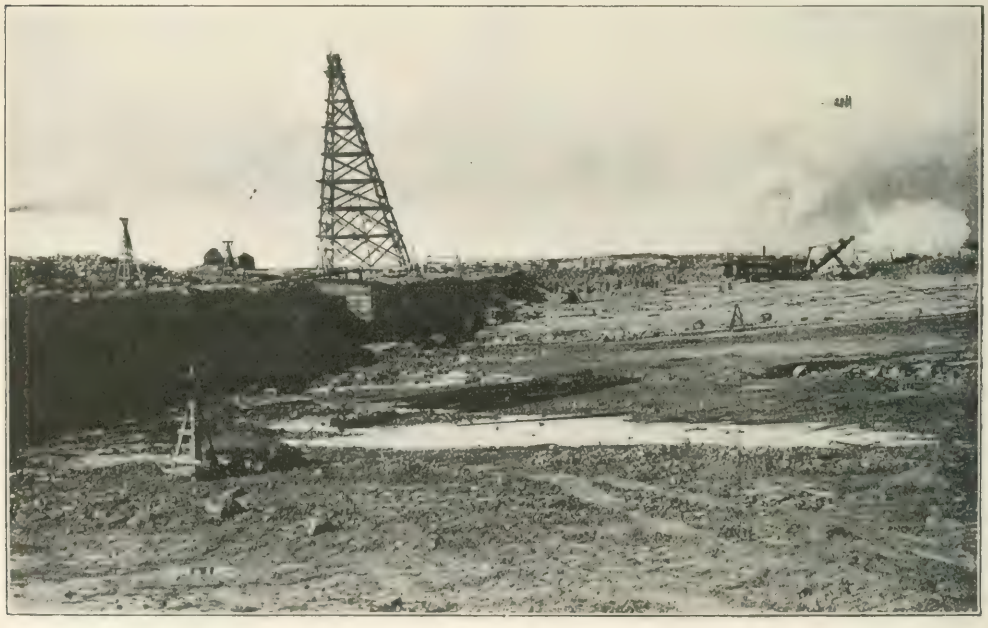
He had triumphed. There had been anxious hours as the waters receded, and the question as to whether the barrier reared would be strong enough to withstand the terrific pressure was constantly uppermost. Now that it was all over he might well smile. Scoffers had been put to rout, and the death knell of one of the greatest barriers to further



POWER DRILL GOUGING OUT THE ROCK OF THE LIVINGSTONE CHANNEL IN THE LOWER DETROIT RIVER.

extensions of navigation on the Great Lakes had been sounded. As a result one of the most unusual feats in engineering annals is being carried to a successful conclusion with a rapidity surprising even to those in charge of the work.

Ever since marine interests on the inland seas assumed considerable proportions, that section of the lower Detroit River immediately above Lake Erie has been the Hell Gate of the Great Lakes. Millions of dollars and years of labor were expended by the United States government in its efforts to provide a course that would be commensurate with the



THE LEFT SECTION OF THE WORKS.

needs of our tremendous Great Lakes commerce.

The Lime Kiln Crossing, lying wholly in Canadian waters, was attacked each year by a navy of drillers and dynamiters charged with the task of removing the rocky barriers to further expansion. And as fast as they chipped off six inches of rock from the river bottom vessel owners increased the length of their craft and loaded six inches deeper, leaving conditions relatively no better than before.

It was not so much the money involved that worried government engineers and vesselmen as it was that the necessarily slow process of dynamiting and dredging employed in deepening and widening the channel at this point hampered shipping operations to an extent that was both annoying and costly.

To the west of Lime Kiln Crossing lay a wide expanse of water paralleling the course followed by vessels, and for much of the way, if a few boulders were removed, having a depth sufficient to meet the requirements. If this could be utilized all would be well. But there was a continuation of the ridge of rock that had occasioned so much trouble. At one point this was covered by only two feet of water, and for a mile or more it came close enough to the surface to make navigation with a vessel of any size impossible. How to get rid of this rock was the problem confronting marine interests. If accepted methods were to be employed few vessel men of the present generation would live to see the completion of the job.

LOOKING DOWN ON THE WORK FROM A SEVENTY-FIVE FOOT TOWER.

Then a resourceful Virginian came forward with a proposal that caused veteran marine men to chuckle derisively. His name is C. H. Locher, of a contracting firm that had helped build the Chicago drainage canal when workmen found it necessary to go armed to protect themselves against strikers; had tunneled through mountains while building railroads in the feud districts of Kentucky, when at night the less timorous of the construction crew were lulled to sleep by the popping of rifles as the warring factions indulged in the mild pastime of extermination; had dammed

a portion of St. Mary's River and diverted the course of the water while taking sufficient rock from the bottom to make a new channel; had tunneled through a mountain in Wyoming and turned a rushing torrent from its natural way while he constructed for irrigating purposes the highest dam in the world.

But none of these feats equaled in daring what Locher proposed doing here. The rock and dirt taken from other portions of the new course by dredges was utilized in building the cofferdam, some 200,000 cubic yards of material being required. The cofferdam is a trifle over two and one-half miles in circumference, fifteen hundred feet wide, and was divided into three cross sections by two cross dams each fifteen hundred feet in length, to expedite the work.

LOOKING SOUTH ON LIVINGSTONE CHANNEL, SHOWING WHERE TWENTY-TWO FEET OF ROCK WAS TAKEN OUT "IN THE DRY."

His plan was to build a giant cofferdam around that portion of the river bed where the rock was most troublesome, pump the water from this enclosure and establish a quarry in the bed of the river where the men could work with no more inconvenience than if there was not a mile of water on either side of the slight barrier of rock and dirt that protected them from the floods. It was a reclamation project beyond the wildest flights of fancy, and aroused no end of forebodings.

With a thoroughness that knew no such word as failure, Locher, together with his brother, George P. Locher, who had superintended some of the more important undertakings, set about the task.

When the middle or first section of the cofferdam had been completed pumps and air lifts were started, and the enclosed area was entirely drained. Then while the cofferdam was extended in either direction on the other sections drillers and channelers and steam shovels attacked the bed of the river. This was a solid mass of Niagara limestone from which, to secure the required depth of twenty-four feet of water, it was necessary to remove from the crown in the center twenty-two feet of rock, and at either end not less than eight feet.

As fast as ten-ton steam shovels could load buckets, or skips, as they are technically termed, these would be carried on cableways and the rock dumped on a pile

DOWN TWENTY FEET BELOW THE NATURAL RIVER BED.

at one side. Day and night the work progressed, stopping only on Sundays, the speed becoming greater as the army of toilers became familiar with the task. Now the course originally planned to be done "in the dry" is finished fifteen months ahead of the time limit exacted by the government.

Standing at either end of the cofferdam and looking along the channel, there stretches away for a mile a gash in the river bed three hundred feet wide, and for the greater portion of the way averaging twenty feet in depth, flanked on one side by a sixty foot mountain of rock. The sides of the channel look as though they might have been cut with a saw, so smooth is the surface, and the bottom of the course has been leveled off with a nicety that reminds one more than anything else of a colossal dancing floor.

In cutting this course something more than 900,000 cubic yards of rock has been taken out. This is equivalent to 1,800,000 tons. To transport this rock would require the combined carrying capacity of one hundred and eighty freight steamers of the largest type on the Great Lakes. And as affording a means of comparison between carrying methods on the Great Lakes and by rail it is interesting to note that these same one hundred and eighty boat loads would fill 45,000 forty-ton freight cars. This would make a solid train four hundred and twenty-six miles long, and on a very conservative basis of computation take nine hundred locomotives to move the mass once it was loaded. And this giant train, once it got under way, would be four hundred and forty miles long.

Not content with what has been accomplished, the government has very wisely decided to go further at this time, and while providing for future needs incidentally save some money. While the cofferdam is in place and everything is in readiness the channel is to be widened another one hundred and fifty feet, making it four hundred and fifty feet across. This will necessitate the removal of another 450,000 cubic yards of rock, and require an expenditure of $650,000, in addition to the $1,500,000 which has already been put into the "dry" section.

It will be money well spent, however. When the last of the dry work has been

TEN-TON SHOVEL WHICH TOSSES ROCK FROM THE CHANNEL LIKE SOME HUGE GIANT.

completed and the cofferdams opened to let the water back in, and the dredges which are working in the wet for several miles in either direction have completed their labors, something like $8,000,000 will have put into the bottom of the river in a little matter of eight miles; but engineers assert that lake commerce will be provided for all time at this point, and that the Hell Gate of the Great Lakes will speedily become only a memory.

Time

For time is like a fashionable host
That slightly shakes his parting guest by the hand
And with his arm outstretched, as he would fly,
Grasps in the comer; welcome ever smiles,
And farewell goes out sighing.
O, let not virtue seek
Remuneration for the thing it was;
For beauty, wit,
High birth, vigor of bone, desert in service,
Love, friendship, charity, are subject all
To envious and calumniating time.

—SHAKESPEARE.

PHOSPHORUS AND JUMPING JACKS

By

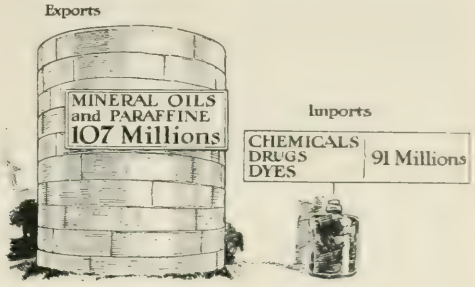
HENRY M. HYDE

PHOSPHORUS is the most valuable substance in the world. Gold, diamonds, rubies, a hundred other elements and compounds cost vastly more. Yet when the supply of any one of these is exhausted some other can be found to take its place or do its work. Few of them are essential to human life.

When the world's supply of phosphorus is gone, however, every form of life will stop with it. That is true because without phosphorus in the soil vegetation can not exist. Irrigate as skillfully as you please, fill the earth with the beneficial microbes which continually renew its stock of nitrogen from the limitless reservoir of the air, obey to the utmost every law and rule of successful and scientific agriculture, yet lacking phosphorus—and that alone—your fields shall remain sterile and barren.

Other elements and substances are equally essential with phosphorus to the perpetuation of vegetable—and animal—life. But the world's visible supply of most of them is vast and, apparently, practically inexhaustible. Phosphorus at least in such shape as to be available occurs, on the other hand, in only a few localities and in limited quantities. And the danger of a phosphorus famine is by no means as remote as it might appear.

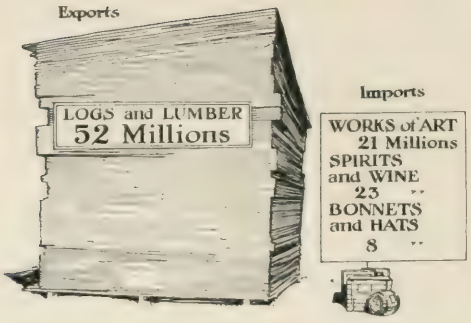
All over the country, but particularly in the Atlantic and Southern states, where tillage has continued for hundreds of years, the lack of phosphorus in the soil is partly responsible for diminishing crops, for poor and abandoned farms. A huge corn crop, like that of the present



year, takes millions of tons of phosphorus out of the soil and—to that extent—lowers the future fertility of the land.

The chief deposits of available phosphates in the United States are found in Florida, South Carolina and Tennessee. They are also the richest and largest deposits of phosphorous rock so far discovered anywhere in the world. There are a few similar deposits in Europe, and geologists have searched and are still searching everywhere for new finds.

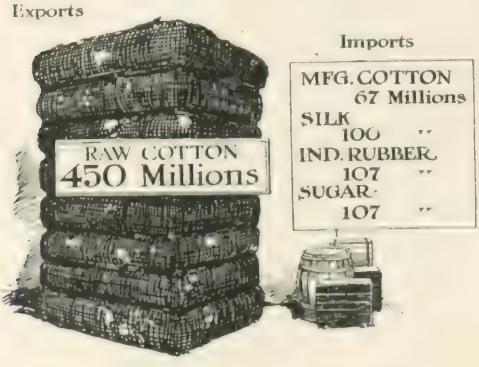
In Europe the phosphorus deposits are carefully guarded as storehouses of future national prosperity and support. The laws of Norway, for instance, make it almost impossible—which means unprofitable—to send the precious phosphate rock, there discovered, out of the country. It is kept at home by legislative enactment to preserve the fertility of the Norwegian farming lands.



In the United States, to the contrary, the great beds of phosphate rock are recklessly exploited for the benefit of the individual and often foreign owners. The greatest of agricultural experts estimate that the total production of phosphate rock in America is not greater than would be required to renew the phosphorus annually drained from the soil by the crops. But two-thirds of it are regularly exported, sent abroad, most of it to Germany, for the enrichment of German farmers and the ultimate impoverishment of American farms.

When one requires an explanation of why the ancient fields along the Rhine raise double the wheat cut on our own new lands, he may find it in the holds of German freighters loaded with phosphate rock from Florida.

By way of paying for this most precious and necessary of natural products, the shrewd Germans, smiling in their sleeves, send over a few cases filled with waste bits of wood and metal, skillfully carved and painted, toys and gimcracks given their sole value by the skill and ingenuity of German mechanics. In other words they exchange for a million tons of an extremely limited and absolutely essential natural product—the work of nature and slow time—something that man cannot duplicate or replace—a million gross of jumping jacks and Noah's arks, products of cheap human labor, containing nothing intrinsically valuable, serving no useful purpose, easy to duplicate indefinitely and forever.



The story of phosphate rock is only an index to the great volume of our foreign trade. Individually shrewd, piling up for himself a great fortune, the American business man, in the mass and in the long run, is no better than the plantation negro who spends the money necessary to support him through the winter in buying pinch-beck jewelry and purple socks.

The common European contempt for Americans is based partly on the fact that they find us so easy when it comes to making a trade. Who, for instance, would not grin, if he could persuade a stranger to exchange $43,000,000 worth of coal and coke for a few handfuls of shining pebbles? Yet during the last fiscal year the United States exported coal and coke to that amount and imported diamonds and other precious stones to the value of four millions more.

We are fond of boasting of the wonderful enterprise of that great business organization, the Standard Oil Company, which sends in huge tank steamers and ship-loads of tin cases, kerosene oil, gasoline and other products, to the far corners of the world. Year after year it sends abroad hundreds of millions of gallons of natural oil—crudely refined—pumped from the bosom of the earth. Americans have found empty Standard Oil cans in the remote interior of China, in the center of the dark continent, and

have felt a patriotic thrill at the sight. Last year alone the exports of mineral oils and paraffin amount to $107,000,000. Verily we light the world! But at what a cost! As the stockholders of the Standard grow richer the deposits and wells of oil in the United States grow constantly smaller—more nearly empty.

And what do we get in trade for all this oil, which can never be replaced? From the table of imports for the same year read these figures: Chemicals, drugs and dyes, $91,000,000—within $16,000,000 of the total value of the oils exported. Most of these chemicals, drugs and dyes are made from coal tar—fifty years ago an utter waste and nuisance—now transformed by the skill and science of German chemists into a hundred useful and valuable products. A single ship will hold enough to balance in value all the cargoes of the whole Standard Oil fleet.

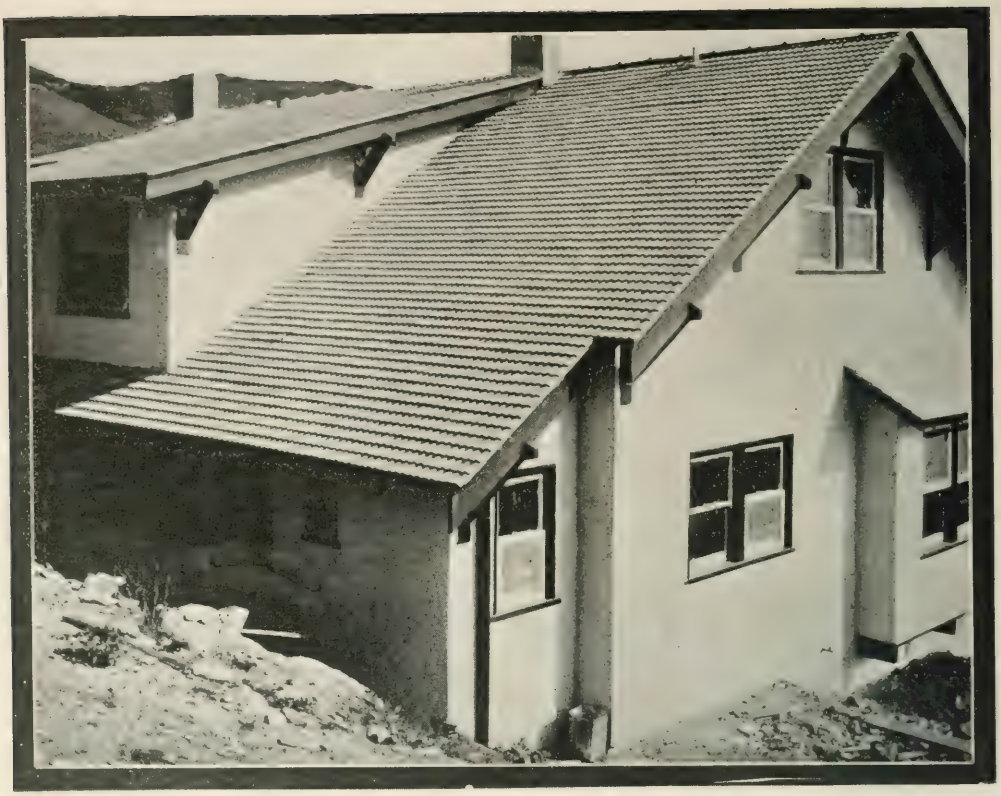
Last year we sent abroad from the yield of our vanishing forests, logs and lumber to the value of $52,000,000. We got back in return from the shrewder and more far-sighted business men of Europe works of art valued at $21,000,000, spirits and wines at $23,000,000 and bonnets and hats at $8,000,000, a total of which exactly balances our lumber exports. Works of art are the product of man's talent, wines and liquor are little more than bottled water and sunshine, and hats and bonnets owe all their value to the taste and cunning of a few men in Paris. But it takes nature thirty to a thousand years to grow a tree.

Our exports of breadstuffs are less than formerly because we have already partially exhausted our soil. But last year the item still stood at $133,000,000. Balance it if you please from the table of imports with coffee, tea and cocoa at $95,000,000, earthenware, china and glass at $18,000,000 and toys at $7,000,000 more. The production of coffee, tea and cocoa does little to impoverish the soil and china, and toys and glass are products of man's skill.

Always we ship away great quantities of more or less raw material and get back in payment a little package of manufactured goods. The imports and exports of tobacco for instance, are not far apart in value. But even in this trade we give more than seven times as much, by weight, as we receive.

More than half our total imports is made up of articles of luxury, of products which do not exhaust the soil, in which they are grown or of manufactured goods, the value of which is chiefly due to man's delicate skill and careful manipulation; while the great bulk of our exports are the ravished spoil of our great natural resources grabbed by the shrewdest and strongest and sent abroad by the millions of tons, by men whose only idea is to fatten their own pockets.

Meanwhile poor little Switzerland, with practically no natural resources, grows continually richer, by putting on the market its mountain scenery, which is never exhausted, by carving tiny bits of wood until they are worth tons of raw lumber and by turning imported iron, worth $20 a ton, into steel watch springs, worth half as many millions.



CEMENT SHINGLES ARE PRACTICALLY NON-CONDUCTORS OF HEAT AND FORM COOL ROOFS. MOREOVER THEY ARE WATER-TIGHT.

SHINGLES MADE OF SAND

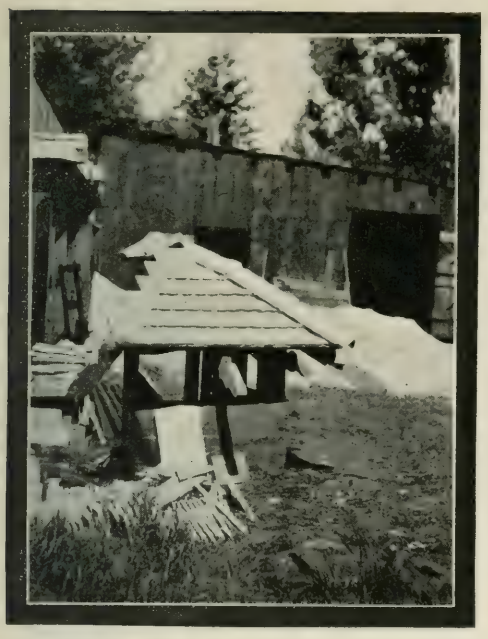
By

CHARLTON LAWRENCE EDHOLM

CEMENT has been successfully used in a great variety of construction work, and yet one is constantly learning of some new use to which it can be put. One of the late forms of cement as a building material is the shingle, which has been demonstrated by actual use to be an exceedingly good roofing material, and in the long run an economical one.

The great advantage of the cement roof is that it is absolutely fire proof and practically indestructible, not deteriorating with age as do wooden shingles or tin roofs, but, on the contrary, improving, as cement becomes harder and tougher with service.

The shingles made under a new patent are six by twelve inches and one-quarter of an inch in thickness. To quote from an official description: "On the upper surface are two ridges with corresponding depressions underneath. Five inches from the top of the shingle is a shoulder, three-quarters of an inch thick, which runs out to the average thickness of the shingle, conforming to the pitch of the roof. This shoulder has a double pur-



THE METHOD OF SETTING IS SUCH THAT A SINGLE SHINGLE MAY BE REMOVED WITHOUT DISTURBING THE OTHERS.

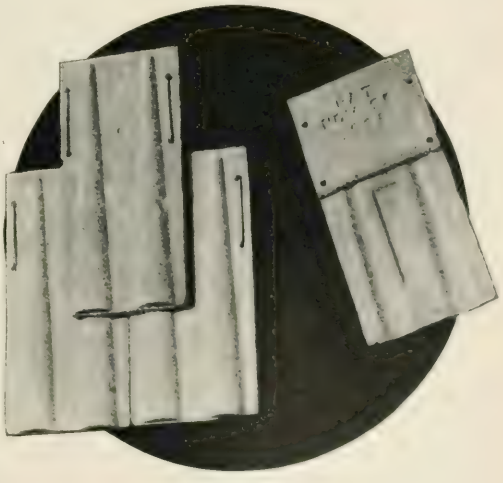
pose. It forms an anchorage for the shingle when in place, so that it cannot slip down over the course below; and it furnishes a base or footing for the upper part of the shingle which would otherwise be left under a strain. The shingles are laid with five inches to the weather, the grooves fitting over the ridge of the shingles on the next lower course. Originally the shingles were fastened on with a wire clasp, for which two holes were made on each side. It has been found more practicable, however, to fasten them with wire nails having a small head, because it is much easier to replace broken shingles. Hip and valley shingles are cut when first moulded.

"From the crests of roofs, ridges are made covering about three courses of shingles. These ridges overlap each other and ornamental straps covering the ends are cemented on, making perfectly tight joints. For hips, specially moulded rolls are used, with cemented joints.

"The manufacture of the shingle is an interesting process. There is a bed mould of solid steel over which are fitted forms of galvanized iron, one for each shingle. For the body of the shingles, cement and sand are mixed in suitable proportions, three to one. A finer grade of sand than that put in the body is used for the upper surface. Waterproofing is mixed dry with the surface sand and cement, and the mixture is sprinkled over the forms. Then the wet cement mortar is spread and the top mould, which forms the under surface of the shingle, is dropped several times, tamping the mixture in solid. The shingles remain on the thin forms and are removed from the machine on a frame and placed on drying racks. They are cured for ten days, being kept damp during this period. In two weeks they are, or may be, laid. They may be kept in their natural state, gray, or colored to suit the purchaser. For coloring, cement stains are used, the fluid being brushed over the top surfaces and edges. Colors may be mixed in the cement, but as the coloring compound retards cohesion the stain is preferable. This goes well below the surface and is not destroyed by the weather. Fine color effects are secured by the use of various shades of green and red."

Although the weight of the cement shingle is considerable, it was not found necessary to use any special construction to sustain the roofs, as two by four rafters and ceiling joists were sufficiently strong, with purlins one inch thick run midway along each slope, and two by four braces under each rafter.

Of course the first cost of a cement



THE SHINGLE ITSELF.
Showing wire method of holding in place.

roof is greater than that of an ordinary shingle roof, about twice as much as a good grade of wooden shingle, but, inasmuch as it is permanent and requires no repairs, it is truly economical. About the only thing that can injure this roof is the ubiquitous and iniquitous small boy who might shy a rock on it and break a shingle, but in that case a new one can be readily set in without removing the others, as they can be lifted from their position without drawing the small headed nails which anchor them. It has been proved that they form a water tight roof and unless the pitch is very low it is not even necessary to use tar-paper under them.

Owing to the waterproofing of the cement shingles they do not absorb moisture to any extent, in fact when tested by a three days' immersion in water, it has been found that they do not absorb more than three per cent of their original weight, and, of course, in service the absorption would be much less.

One of the greatest advantages of the cement shingles in a warm climate is that they are practically non-conductors of heat and form cool roofs.

While the expense of a cement roof is greater than that of a cedar roof, the difference in price can be more than equalized by the use of this new invention instead of clapboards, as a siding of cement shingle is considerably cheaper than lumber and is excellent for that purpose.

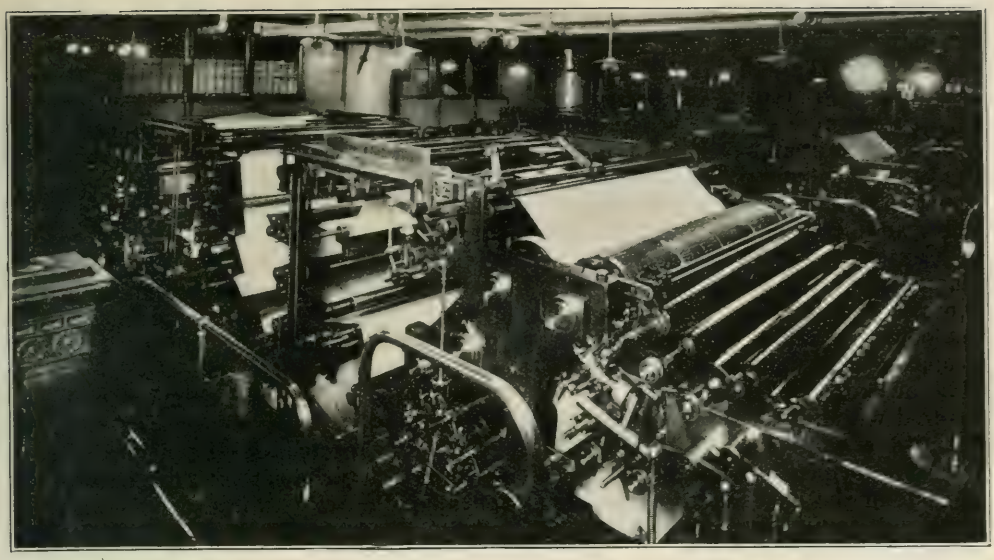
The accompanying photograph, showing a house roofed with cement shingles, was taken in Los Angeles, California, and it will be observed that its appearance is dignified and artistic.

John Anderson, My Jo

John Anderson, my jo, John,
When we were first acquent
Your locks were like the raven,
Your bonny brow was brent;
But now your brow is beld, John,
Your locks are like the snaw;
But blessings on your frosty pow,
John Anderson, my jo.

John Anderson, my jo, John,
We clamb the hill thegither;
And monie a canty day, John,
We've had wi' ane anither.
Now we maun totter down, John,
But hand in hand we'll go,
And sleep thegither at the foot,
John Anderson, my jo.

—Robert Burns.



THE PRESSES OF A METROPOLITAN NEWSPAPER TODAY.
Where ink is literally used by the barrelful.

PRINTING WITHOUT INK

By

CECIL BEMBRIDGE

THE newspaper printing machine room was a hive of humming activity. The ponderous mechanical creations were reeling off the newspapers at thirty odd thousand copies per hour, chewing up the paper from a continuous roll at one end, and disgorging news-sheets folded and counted in quires ready for the newsboys at the other. When the press had settled down to its stride, the rattle and roar was such that one had to shout in one's companion's ears to make one's self heard.

"Br-rr-rr-rr-rr!"

The frenzied call of the warning bell was heard loud above the din. To the accompaniment of strident tones the power was shut off, the mammoth mass slackened in its mad speed, and in a few seconds the maze of wheels and reels was at rest.

"Those rollers are cut up badly, and the inking is imperfect," rapped out the chief, pointing to the bowels of the machine.

Instantly three or four men dived into the mechanical giant and were feverishly tearing out the damaged inking rollers. Others held in reserve were caught up and rushed into their place. Some of the gang were busily attending to the ink ducts, recharging them with the black pigment, and looking around to see that all there was in order, ample evidence of the operation being shown in the smothering of their over-alls and hands with the viscous black mass.

"Look alive," yelled the chief, "this stop has cost us five minutes, and we must make up time."

Whirr! The maze of steel was soon again in full swing, running more madly and noisily than ever in the frantic effort

to make up lost time, for in a newspaper office the schedule is cut so fine, that seconds mean dollars.

Such a scene is typical of the modern newspaper machine room of today. Contrast it with what it will be in the near future as it was revealed to the writer. The printing art has undergone many strange and remarkable developments since Caxton's time, but yet the same fundamental principles are there. The type must be inked before an impression can be obtained, and although this operation appears simple and trivial and is quickly accomplished, yet the fact remains that without the pigment the ordinary press would be useless. And the inking arrangements consequently constitute one of the most vital processes in printing. A failure here and the whole mechanical effort is useless.

Yet the printing machine of the future will be absolutely devoid of ink and all its requisite mechanism. The mammoth press will have its dimensions cut down by one-fourth at least. Printing will be as clean a task as typewriting. Papers will be reeled off at far greater speeds, and the operation will cost less.

And how will it be done? What medium will supersede the ink?

The answer to this apparently impossible enigma is the electric current. The same remarkable energy as drives the intricate nests of wheels will be the means of causing the type to record its impression indelibly upon the paper in any desired color, and without the aid of any pigment whatever. An English inventor has found a means whereby when one pole of electricity is connected to the type, and the other to the metallic bed or platen upon which the paper is laid during the moment it comes into contact with the type, an electro-chemical action is precipitated whereby the impression is received.

Some twelve years ago the inventor in question was engaged in some electrical experiments in his laboratory. On the table he had spread out a sheet of tin upon which rested a piece of moist paper. An electrical battery stood by his side and the bare ends of the wires trailed over the moist paper. A certain electro-metallurgical action in connection with gold was the object of his quest. He dipped his hands into his pocket to select an English gold coin as a makeshift for the experiment in hand. One fell from his hand and to prevent it making a bee-line to the floor he sharply clapped his hand on it. But it so happened that in so doing the coin was brought down upon the bare end of one of the wires on the paper, while the other wire was resting on the tin. When he picked up the fugitive he was surprised to find clearly reproduced upon the piece of paper the obverse impression of the coin in a clear brownish black. It was just as if the coin had been inked and then pressed on the paper.

This unexpected development caused no little astonishment, and he carefully repeated the experiment with various coins connecting one wire with the coin and pressing it firmly upon the paper while the other wire was attached to the tin sheet. The result was always the same, no matter whether the coin was gold, silver, or bronze.

The inventor fell to thinking hard. Why if coins could be printed in this manner should not ordinary type give its impression? There appeared no adverse reason so he set to work to continue the investigation of the phenomenon upon which he had so inadvertently stumbled. He procured some bars of linotype and repeated the trials. The result was just the same. The imprint stood out clearly and distinctly. There was not the slightest imperfection in regard to any letter, no blurring, and it did not matter whether the pressure was heavy or light, uniformly or unevenly distributed; so long as a clear contact was established the imprint was obtained. These experiments were extremely crude for there was only a slab of zinc, instead of the original tin, laid on the bench to serve as a bed, upon which the moistened paper was laid, while physical effort served to supply the pressure. In these primitive trials with two simple wires from a battery, however, he discovered one or two vital factors. Density of the impression varied according to the strength of the current, while it was essential that the positive pole should be connected to the zinc and the negative to the type.

The first impressions with ordinary

paper slightly moistened so as to improve conductivity always produced a brownish imprint, so he at once set to work to devise ways and means of securing a jet black impression. This quest entailed dipping into exhaustive chemical experiments in relation to the action of the electric current, and it was some time before he discovered what chemical it was necessary to add to the paper to bring about the desired result. Test after test was made, first with this chemical and then with that, some inexpensive and easily available, others very costly and more difficult to procure. The search was at first very elusive, for he could not secure permanency, or if such were gained the paper in course of time blackened under the combined action of the chemical and the electric current. For ten years he has wrestled with the problem and now complete success has attended his efforts, and it has been found that the most satisfactory results are secured with lead type and paper immersed in a solution containing a small proportion of one of the cheapest chemicals obtainable.

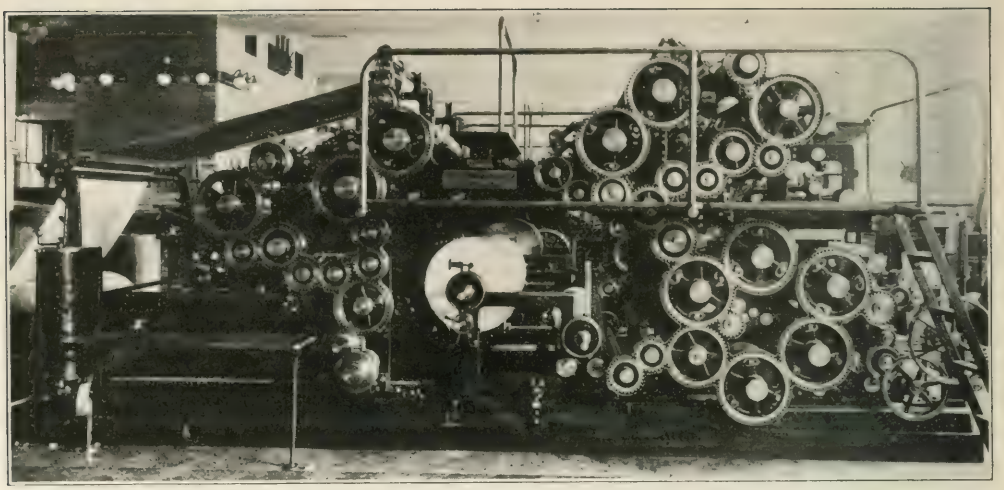
The type of press designed for use with this remarkable discovery is, in comparison with the ordinary apparatus, quaintly novel. Ink rollers are conspicuous by their absence, as are also the pigment ducts. It merely comprises large rollers constituting the metallic platen sheathed with zinc well insulated, over which the paper travels, and to which the positive electric wires are connected. The type, in the form of a stereo, is bent round another roller which is similarly insulated and a suitable connection effected with the negative wire. A few other rollers are necessary to guide and feed the paper both to and from the point of contact and so on. But the most conspicuous feature is the absence of the ink rolls, ducts and their pertaining mechanism.

When the discovery was first announced it was hailed with ill concealed skepticism. It was considered to be a modification of a photographic process, such as had been vainly attempted time after time, and that the impression was secured by actinic agency. When this was conclusively refuted by practical demonstration, which showed that the chemicals impregnated with the paper were not influenced by actinicism, but were purely oxidized by the passage of the electric current at every point where the type was brought into contact with the paper and then only superficially, it was declared to be but a temporary impression and one that would disappear by chemical reaction or by the effluxion of time.

The invention like many others was premature, and the critics refused to realize that such an achievement was possessed of any commercial value. True, at that time it was somewhat primitive and its possibilities were limited. But the inventor was not a whit dismayed. He set quietly to work and has continued his investigations incessantly for several years past and has now achieved complete success—one in which every requirement is fully met, and commercial practicability is assured. To silence captious critics as to deficiency in durability a large art booklet was printed ten years ago with the type in brown and the illustrations in black by this means. Today the type is as clear and as free from the slightest sign of fading as if it had come red-hot from the machine. Numerous subjects were printed on various grades of paper and the only signs of visible decay are those of the paper itself, such as would attend imprints under ordinary conditions at the same period, and which are inseparable from wood pulp.

During the past two or three years, however, the inventor has made great strides. He has solved the question of printing in colors from any subject in relief, whether it be type, stereos, halftone blocks or what not, both on paper and textile fabrics in such a way as to be absolutely permanent and at far less expense than attends the same operations on the ordinary machine. In the course of his investigations concerning conductive oxydizable chemicals under the action of the electric current he has elaborated a wide range of formulae, of simple character, for achieving the desired end. One can now have a newspaper printed in all the colors of the rainbow at a single impression, and any combination of colors that can possibly be conceived is easily obtainable.

This phase of the invention is ob-



THE BIG GOVERNMENT PRESS, AT WASHINGTON, UPON WHICH THE CONGRESSIONAL RECORD IS PRINTED.

An Englishman's invention will do this printing without ink, through a slight change in the machinery.

viously secret, but it is a vital fact that the color effects are obtained with the cheapest chemicals known, either individually or in combination. This search was possibly the most exasperating phase of the whole quest for it involved something like 5,000 experiments. It is essential that printing should be carried out by this process with the paper in the dry condition. That is to say, the necessity of passing the paper through a chemical solution immediately before printing is dispensed with. To secure this end the chemicals are associated with the paper at the pulp mills. In this direction the inventor could not find a papermaker sufficiently enterprising to participate in these experiments, so accordingly he acquired a small mill where he pursued his hunt in absolute privacy, accompanying this with elaborate investigation in the solitude of his own laboratory. Now it is possible to prepare the rolls of paper in illimitable quantities impregnated with the necessary chemicals, and in such a way that the paper can be stored indefinitely without suffering the slightest deterioration.

For heliochromatic printing the invention is of far reaching consequence. The impressions are made in instantaneous succession, the paper obviously being impregnated with the necessary chemicals to bring about the desired result in conjunction with certain metals. Thus, for instance, the block designed to give the yellow impression is made of zinc, that for the red of brass, and the blue of copper. Other commercial metals such as tin, iron, silver, platinum, gold, and so on will give in conjunction with certain chemicals, distinctive colors with infallible accuracy and certainty.

The task of the printer is very appreciably facilitated and there is a conspicuous saving in cost, time and labor. All preliminary preparations technically known as "making ready" are obviated, for wherever there is a clear contact between the metal and the paper an impression must be secured. The printing process itself is so simple that a boy can do it. The simplification of the machine itself, whether it be of the intricate mammoth rotary newspaper type or the small cylindrical flat bed machine brings about a coincident diminution in the call for skill. In this case however it is not necessary to scrap existing machines as such can be readily and inexpensively adapted to the new process. Printing, although already carried out at high speeds, can be very appreciably accelerated, the speed factor being entirely dependent upon the strains which the paper itelf can sustain in rushing through the machine.

Apart from the mere printing question, the electrical system is of considerable

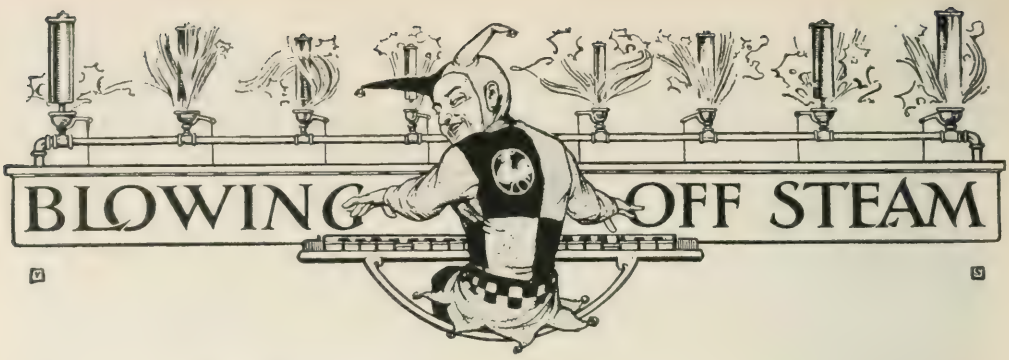
economic importance and value. In the first place there is the saving effected in regard to the ink and rollers which in themselves constitute a formidable item. Then secondly it solves the "waste" problem, in a very complete manner. Under existing circumstances the waste from the machines as well as the "returns" is of little commercial value. The ink cannot be eliminated in re-pulping and completely defies all known bleaching processes. Such repulped waste can thus only be converted into a cheap grade of paper for general packing purposes. In the case of the electrical system however as there is no deposit on the paper, the waste can be repulped and re-made up again into the same kind of article it was in the first place, the oxidation of the chemicals caused by the electric current being easily and cheaply removable especially by an electrolytic bleaching method the inventor has devised. This paper can be used over and over again.

Experiments have shown that it is equally applicable to printing patterns and designs on textile fabrics. In this instance the material is simply impregnated with the requisite chemicals which in themselves do not exercise any deleterious effect upon the most delicate fabrics. Wall papers and other decorative materials can also be printed by this process and it can be so devised as to print and emboss at the same time.

Another striking evidence of its possibility was afforded the writer. This was in connection with photogravure printing. The largest pictures can be reproduced by this means, including the plate sunk mark, and the depths, softness of the tones, and other characteristics incidental to this class of printing, can be so beautifully obtained, that the electrical inkless reproduction cannot be distinguished from the ordinary hand pulled impression with ink, unless it is in regard to the enhanced softness and beauty of the picture. Instead of the printer toiling laboriously carefully inking and preparing the plate, all that is necessary is to lay the sheet of paper beneath the plate and then apply the pressure in the ordinary manner after the electrical connections have been effected. The whole operation only occupies a second and the speed of printing is governed entirely by the speed with which the paper can be fed into the machine.

At first it might be thought that considerable wear and tear to the metallic substance from which the impression is made, be it either type or block, would result, but such is not the case. The wear and tear is not so great as in ordinary printing and no electrolysis takes place. Then again it might be thought that the consumption of current might be so high as to off-set the saving in ink, but here again there is distinct disillusion. An ordinary small printing machine such as is employed for printing circulars can reel off its work at less than half a cent's worth of electricity from a sixteen candle power lamp, per hour. Control is very simple, comprising merely a switch and a new type of gradual resistance which the inventor has especially devised for the work to increase intensity of the impression or vice versa. The impression cannot be blurred owing to the absence of deposit.

Since the first results with this process were secured chemical investigation and research have advanced by leaps and bounds, and it is the result of these latter efforts that has brought the invention within the realm of practical commercial application, as many of the chemicals required to produce certain results are now extremely cheap. What ten years ago was but a striking experiment in electrical science, is today far cheaper than any printing system in vogue, and it is safe to assert that this century will not advance many more years before the ink manufacturer disappears from printing ken. A considerable part of the invention as an entity is a secret, since there is a maze of formulae to be taken into consideration, and in a great measure this affects the paper maker. But these in themselves are so simple, and the chemicals necessary for combination with the pulp for printing by electricity without ink are so inexpensive as to render this point so infinitesimal as not to be worthy of consideration.



His Intentions were Honorable

A BASHFUL young lover walked into the house of his sweetheart bearing a large box with the name of a prominent florist written on the cover.

"How sweet and fresh they are!" cried the young lady, opening the box. "I believe there is a little dew on them yet."

"Why—er—yes," admitted the young man in great confusion, "but it's just a little, and I'll pay it tomorrow."—*Success.*

The Host's Merry Pun

"SERVE the champagne in tin cups, Oscar," directed the owner of the bungalow. "Very good, sir." "These hunting parties like to rough it a trifle."—*Washington Herald.*

The Wisdom of Youth

MINISTER—"And how did Noah spend his time in the ark?"

SMALL BOY—"Fishin'."

MINISTER—"A vera reasonable suggestion, my laddie."

SMALL BOY (guardedly)—"But he wouldna catch muckle."

MINISTER (surprised)—"What makes ye think that?"

SMALL BOY (knowingly)—"Because, ye see, he had only twa wir-rms!"

The Only One Lacking

"WHY are you so sure there is no such thing as a fourth dimension?"

"Because," replied the discouraged fat man, "if there was I'd have it."—*Ladies' Home Journal.*

Do Any of 'Em?

"MISS JONES isn't looking at all like herself this evening."

"Oh, no—she never does."—*Cleveland Leader.*

Science Must Prosper

FIRST DOCTOR—"I've discovered a sure cure for a rare disease."

SECOND DOCTOR—"Great! Now how can we make the rare disease prevalent?"—*Cleveland Leader.*

Sad Deprivation

"WHAT's the matter, little boy?"

"M-maw's gone an' drownded all the kittens."

"Dear! dear! Now that's too bad."

"Yep, she p-promised—boo hoo!—'at I c'u'd do it."—*Harper's Weekly.*

Had 'em Guessing

A DISTINGUISHED novelist recently found himself traveling in a train with two very talkative women. Having recognized him from his published portraits, they opened fire upon him in regard to his novels, praising them in a manner which was unendurable to the sensitive author. Presently the train entered a tunnel, and in the darkness the novelist raised the back of his hand to his lips and kissed it soundingly. When light returned he found the two women regarding one another

in icy silence. Addressing them with great suavity, he said, "Ah, ladies, the one great regret of my life will be that I shall never know which of you it was that kissed me!"—*San Francisco Argonaut.*

True, Oh, Very True!

"CHILDREN," said the minister, addressing the Sunday-school, "I want to talk to you a few moments about one of the most important organs in the whole world. What is it that throbs away, beats away, never stopping, never ceasing, whether you wake or sleep, night and day, week in and week out, month in and month out, year in and year out, without any volition on your part, hidden away, as it were, in the depths, unseen by you, throbbing, throbbing, rhythmically all your life long?"

And during the pause of oratorical effect came a small voice: "The gas meter."—*Everybody's Magazine.*

The Thinkless Life

"WHAT on earth do you think about while you're fishing?"

"Wal, when the fishin's good I don't git time to think, an' when it's bad, thinkin' don't help it any."—*Scribner's Magazine.*

A Concrete Case

TOMMY—"Pop, what does multum in parvo mean?"

TOMMY'S POP—"Multum in parvo is Latin, my son. It means—er—well, haven't you ever seen a fat woman in a bathing suit?"—*Philadelphia Record.*

The Primrose Path to Ruin

"PROSPERITY has ruined many a man," remarked the moralizer. "Well," rejoined the demoralizer, "if I was going to be ruined at all I'd want prosperity to do it."—*Detroit Free Press.*

How Could It Be?

TOM—"Is your engagement a secret?"

TED—"No; the girl knows it."—*New Orleans Picayune.*

He Knew

THE teacher had been reading to the class about the great forests of America. "And now, boys," she announced afterwards, "which one of you can tell me the pine that has the longest and sharpest needles?" Up went a hand in the front row. "Well, Tommy?" "The porcupine, ma'am."—*Chicago News.*

Dreadful Possibility

"YOUR wife is gone to the dressmaker's to try on a new dress."

"I am glad of that, I feared she had gone to pay for the last one."—*Fliegende Blaetter.*

Truth is Best

FARMER—"Here's a letter from city folks answerin' our ad, Mirandy. They want ter know if there's a bath in the house. What'll I tell 'em?"

HIS WIFE—"Tell 'em the truth. Tell 'em if they need a bath, they'd better take it afore they come."

Reasonable Conclusion

BACHELOR (to intimate friend)—"What would you say if I should—er—tell you that—er—I am going to—er—marry a sweet little widow with six children?"

FRIEND—"I should say you were taking on heirs."—*Harvard Lampoon.*

How Should She Know?

MRS. BANGS—"Do you know, I'm afraid my husband is given to saying things behind my back?"

MISS BRIGHT—"Well, dear, perhaps the poor fellow cannot get the hooks and eyes to match properly."

The Second Fiddle

TODGERS—"Ah, Count, allow me to introduce you to Mr. Saton."

COUNT—"It ees a great pleasure for me to meet a musician like you, monsieur. I hear zat you and your family play ze music."

SATON—"Me?—why, I don't know anything about music!"

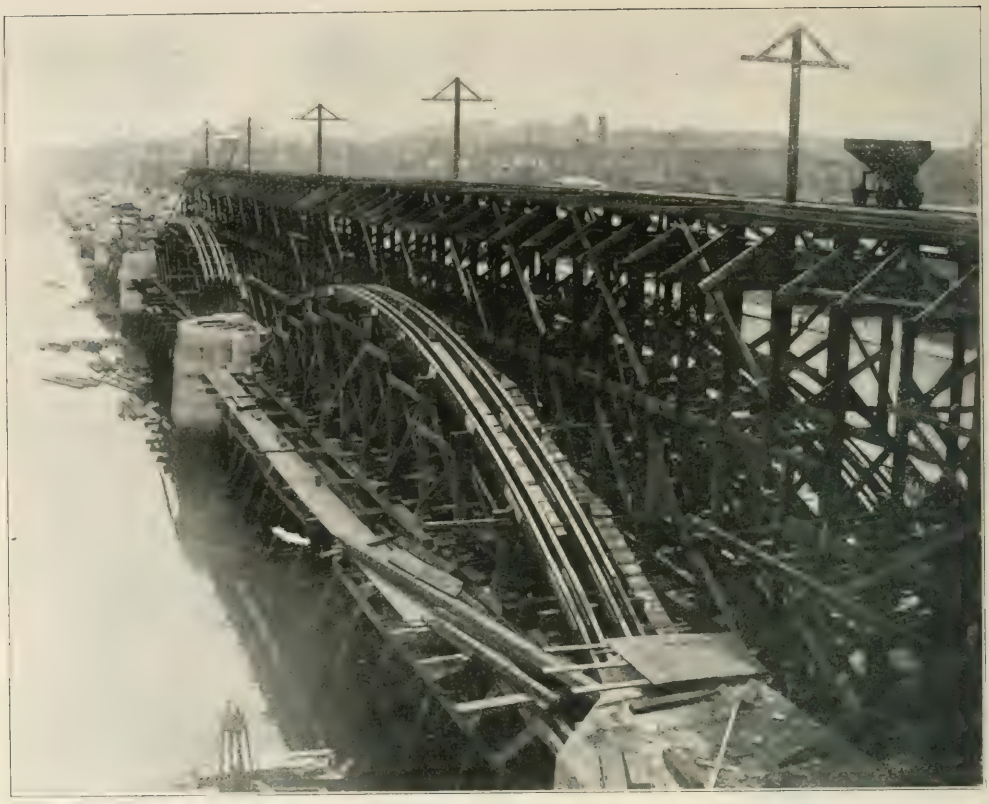
COUNT—"Non? Zey tell me all round zat you play second fiddle to your wife?"—*M. A. P.*

In Yellow Journalism

"SAY, you answer that advertisement for a husband, marry the woman and give us a story."

"But I'm already married."

"All the better. Go ahead and let's have two columns on the sensations of a bigamist."—*Philadelphia Ledger.*



SKELETON OF NEW BRIDGE ON MOLD ERECTED FOR CASTING CONCRETE.
False work indicates height of finished structure.

BOSTON'S NEW BRIDGE

By RALPH BERGENGREN

ONE of the largest reinforced concrete bridges in this country, and one of the longest yet constructed anywhere, is being built at Boston by the local elevated railway company. The new structure spans the Charles River between Boston and Cambridge with a bridge of ten concrete arches, one steel draw span of the bascule type, and a flat arch of steel girders imbedded in concrete. The bridge will be a concrete formation nearly a third of a mile in length. On the Boston side the new bridge will be a continuation of the elevated structure now being built to meet it while on the Cambridge side a decline of about 500 feet will bring the tracks down to the ordinary level of the street.

The arrangement of the new bridge again illustrates what has been often pointed out as a peculiar characteristic of rapid transit in Boston,—the adaptation of one type of car to the three distinct types of electrical transportation. The cars that cross it will travel by subway tunnel from the center of the city, mounting by a long grade from the subway level to that of the elevated structure at the North Union railway terminal, and then, having reached and crossed the bridge, descending by another long grade to the street level in Cambridge. The bridge will be used exclusively for electrical transportation.

POPULAR · SCIENCE & MECHANICS SUPPLEMENT

MEASURING THE EMOTIONS

HERE is a curious contrivance for measuring emotions. The machine is called a "plethysmograph." Its most essential feature is a cylinder, into which the hand and forearm are thrust, in the manner shown in the picture. Rising vertically from the cylinder is a glass tube.

When an agreeable emotion is felt, blood pours into the arteries of the arm, and causes the latter to expand—its increasing volume being shown by the rising of a column of water in the glass tube aforementioned. On the other hand, any disagreeable emotion causes the arm to shrink perceptibly, as shown by the lowering of the column of water in the glass tube. Pleasant emotions cause the blood to flow outward toward the extremities, while unpleasant ones—such as fear or hate—cause it to flow inward toward the heart.

USING THE "MUSSAK."
A goat's skin, inflated, is used in India for transporting packages across streams. Two can handle a heavy burden better than one by this method.

MEASURING THE EMOTIONS
Machine that registers the feelings as affecting the flow of blood in the arm. Pleasant emotions cause it to flow outward and unpleasant emotions cause it to flow inward.

HORNBILL LOCKED IN NEST

WHEN the female hornbill has her nest, usually in a hole in a tree, the male plasters up the entrance of the cavity with mud, leaving an opening just big enough to allow her to poke her beak out. This, of course, is in order that she may be supplied with food while guarded.

It is the business of the male bird to furnish the provender, which he does regularly, while his mate remains temporarily imprisoned. Meanwhile she is safe against attack by enemies which might otherwise threaten her and her young.

LOCKED IN HER NEST.
Female hornbill imprisoned while sitting on her eggs.

SWINGING BRIDGE.
Remarkable structure constructed on suspension lines in Vancouver, B. C.

SUBMARINE SIGNAL.
Hollow ball that can be released by crew, to rise to surface when boat is in distress.

PHILIPPINE ARMOR.
Costume of Moro warrior, which resembles that of ancient Greece.

ARMOR IN THE PHILIPPINES

THE use of body armor survives at the present time to a much greater extent than is generally supposed. Only within recent years, of course, have the Japanese dispensed with it.

Undoubtedly the most beautiful armor of today is that worn by the Moros on the great island of Mindanao and in other parts of the Philippines. It takes the observer back to primitive times, inasmuch as in character it is strikingly Greek. The costume of a Moro warrior, in fact, is a good deal like that of the typical fighting man of ancient Greece 3,000 years ago.

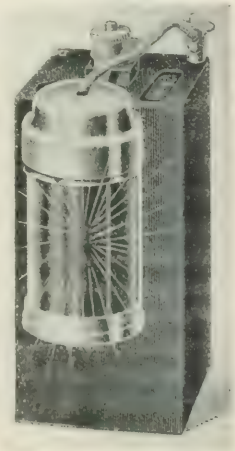
TREES EMBRACE.
Fig-tree grown entirely around a sycamore in Queensland.

JOHN BURROUGHS.
Famous naturalist as one of his most recent portraits shows him.

ELECTRIC RUBY LAMP

A CONVENIENT apparatus for the traveling photographer consists of a low-voltage electric lamp in a tube of red glass. It is lighted by simply connecting it to a small dry battery.

Another lantern for the same purpose contains a five candle-power lamp in a tight case of red glass with flexible wire.



ELECTRIC RUBY LAMP.
Convenient device for traveling photographers' use en route.

School-Boys Printing.
How this useful craft is learned in public schools.

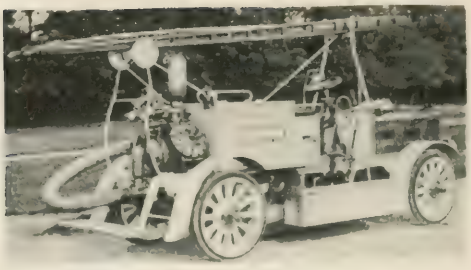
PRINTING IN THE PUBLIC SCHOOLS

TECHNICAL education has made its entrance into our public schools as a reaction against the manual inactivity and purely mental education which has held sway for so many years. Physical training paved the way for industrial education. Handwork now interprets industry, and academic work supplements and stimulates a higher perfection of production. The study of the arts and crafts is fast approaching a par with academic and collegiate education.

The opportunity for an apprentice in printing to become a superior craftsman is more limited today than formerly. The specialization, the preparation for the many departments in the printing business, is such that instead of being turned out an all-round printer with up-to-date ideas on typographical art, the made-to-order printer of today finds his field of work so circumscribed that he is greatly handicapped. On the other hand much of the art as taught in the public schools has failed to find practical expression in after work because it is not adapted to manual methods. These defects may be corrected and harmony brought to common ground in the combined efforts of art and printing. In the first place every piece of printing should be considered from the artistic standpoint. Every page of straight set matter, whether put up in plain or ornamental type, every form of type with or without rule or ornaments, calls for a proper sense of art as relates to type mass, margin, arrangement, combination of letter styles, size of type, spacing for effect, color of ink, etc. The selection of paper for each particular job is a matter of art. The color, the surface, the weight, are determined largely from an artistic

Man-Carrying Kites.
Daring sport with which some aviators are experimenting.

Cleaning the Stack.
German sailors keep their ships in model trim and this illustrates one of their tasks.



PETROL MOTOR FIRE-ENGINE.
Modern design now used in Pembroke, near Dublin, Ireland.

standpoint. In the use of two or more colors on the same piece of work, proper harmony of color schemes is another printing art question well worth studying. The art class may combine with the type composition in making letter text designs on printed pages where a margin has been left for an initial letter.

The metal and wood carving departments may be made to co-operate with printing by cutting out in reverse school monograms, simple outline figures of flowers, insects, vases, tools, brownies, reproduction of book cover designs, etc., and the mechanical drawing department can furnish drawings of the use of the square, circle, or of any figure, which can be prepared by the zinc-etching process and mounted type-high for printing.

A school paper, edited and printed by the pupils in the school, secures greater interest in written work, composition style, paragraphing, sentence construction, etc., than almost any other means employed for this purpose. Here the academic or literary, and the technic or mechanical and artistic all finds harmonious action. It does much to create the right school spirit and associations, and brings to the attention of all the need of free action and interest of hand and head. Editors, business managers, cover design artists, illustrators, proof readers, reporters, compositors, pressmen, etc., each perform a part to complete the harmonious whole. When the student is through he will know when the work is well done, why it is well done, and how it is well done, having gone over and worked out the ground principles of his particular part.

INSECTS THAT FORECAST THE WEATHER.
Caterpillars and insects whose habits are sure signs of fair or foul days.

INSECTS FORETELL THE WEATHER

A CLOSE observer might with safety foretell the conditions of the weather several days in advance by watching carefully the conduct of animals, as they are very sensitive to barometrical variations.

M. Fabre, a French entomologist, gives several illustrations, one being a certain caterpillar. It lives in colonies in pine trees, enveloping the branches with a web in the shelter of which it may devour the leaves.

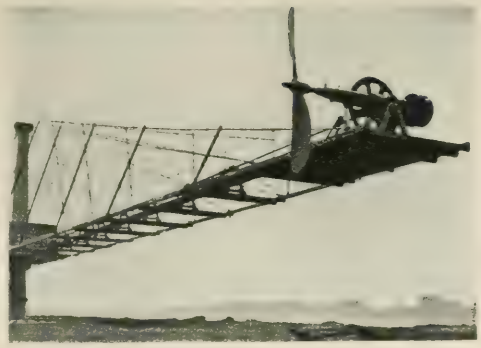
These caterpillars never go out of their nests except at night. When they do not thus leave their tents there is certainly a barometrical depression. Many instances are given in which they have foretold storms.

Another interesting barometric animal is the geotrop, one of the largest of insects. M. Fabre has studied the geotrop by raising some of them in an aviary.

These insects also do not leave their

burrows until after the sun sets, when and only if the weather is suitable.

When the conditions of the sky seem to predict a fine tomorrow, the geotrops are sometimes of another opinion, and it is proved that the insect by the subtlety of its impressions has foreseen—scented the shower—for the rain surely comes during the night. Again, at times, when there is every appearance of rain, the insects come out, and their forecast is correct. The sun rises radiantly the next morning. M. Fabre gives many other analogous observations concerning signals of storms given by animals.



TESTING AERIAL PROPELLERS.
English method of finding out power by mounting screw on the end of a giant turntable and measuring its turning force.

PUZZLE ABOUT PASSENGER PIGEONS

PUBLICATION of the fact that upwards of $3,000 in rewards is offered for the finding of undisturbed nests of the almost extinct passenger pigeon has brought floods of letters from people all over the country who believe that they have discovered breeding colonies of this interesting bird. Much of this correspondence has been addressed to the government Biological Survey, under the mistaken impression that the rewards in question were to be paid by Uncle Sam.

Unfortunately, in every investigated instance the pigeons have proved to be of other species. Ignorant persons in a number of instances have mistaken cuckoos for passenger pigeons, though there is no imaginable resemblance between the two.

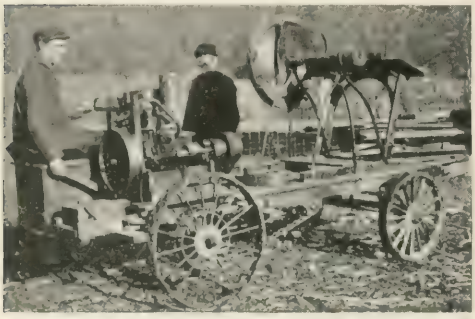
Most frequently, however, the bird mistaken for the passenger is the mourning dove. There is a certain amount of general resemblance between the two, but it is very easy to tell them apart, because the dove is four inches shorter than the passenger pigeon from bill to end of tail and both sexes have black spots on their ears and are brownish on the back, and the forehead is brown.

The passenger pigeon is sixteen inches long, and its middle tail feathers are about twice the length of the outer ones. The male is blue-gray above and on the head, but ruddy underneath; the female is duller colored, inclining to brownish. The nest is a rude, scanty platform of twigs, through which the eggs can usually be seen, and is ordinarily from ten to thirty feet above the ground. On the other hand, the mourning dove's nest is, as a rule, less than ten feet from the ground.

Another bird frequently mistaken for it is of about the same size as the passenger, and is known as the "band-tailed pigeon." It is more stocky, however, and has a square tail. This species is found west of the Rocky Mountains.

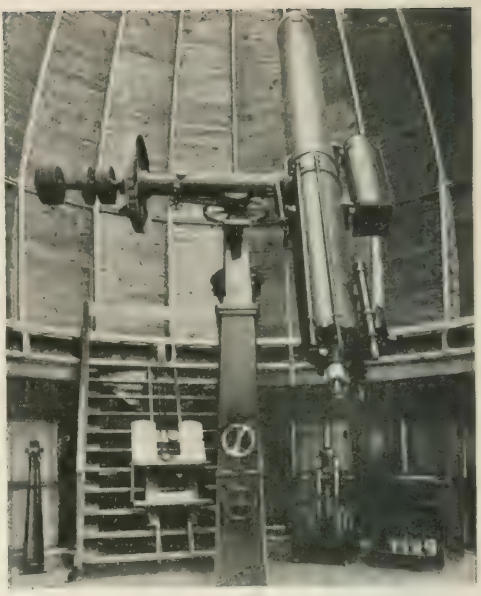
PASSENGER PIGEONS.
Birds whose nests are now rarely found but for which rewards are offered.

Novel Sawing Outfit.
Saw operated by engine mounted on a wagon for easy hauling from place to place. A convenient arrangement.

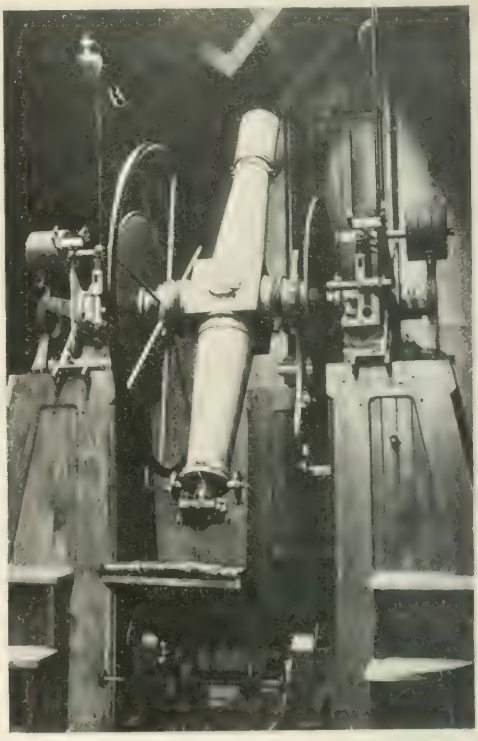


Same Device Ready to Move.
Saw is placed upon wagon for ready transportation to the next place where it is to be used.

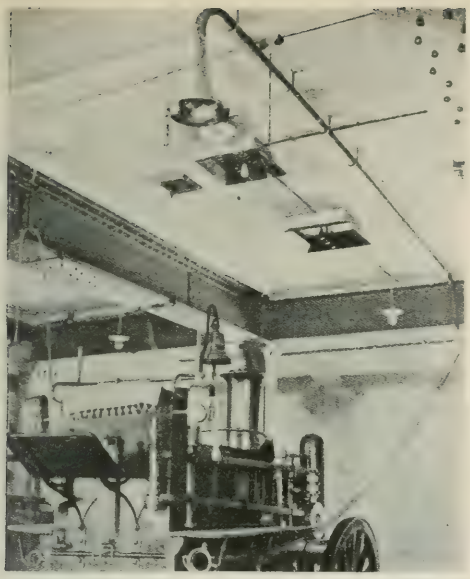
New Automobile Mower.
An interesting German device, the invention of a Berliner, that keeps down the grass on many handsome German places.



Inside Modern Observatory.
Telescope and mechanism, and domelike structure of building are not unlike a big gun in a battleship's turret.



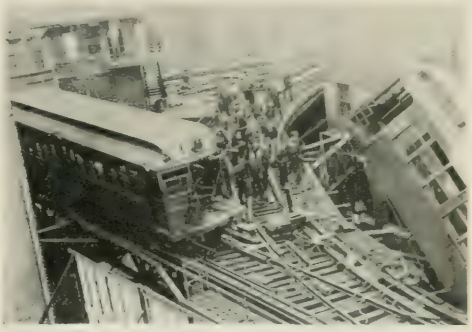
Small Telescope's Mountings.
The machinery for handling these instruments is as delicate as the works of a watch.



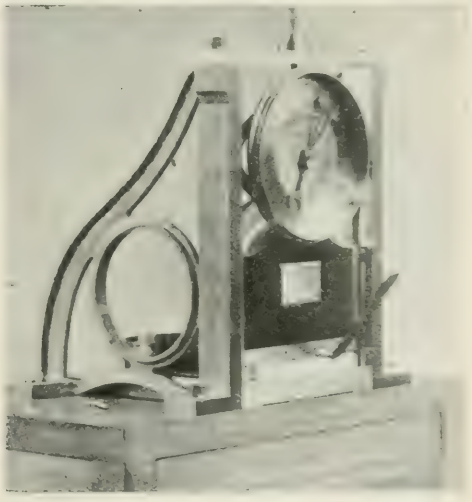
TIME-SAVING FIRE-ALARMS.
New engine house signals consisting of trumpet overhead for driver's orders and colored lights to indicate unspoken directions.

OLD FASHIONED SETTIN' ROOM.
Unusual picture of real New England sort, with grandfather clock, odd wall paper, chintz-covered rocker, tidies, braided rug and deal table.

ELEVATED RAILROAD WRECK.
Such a wreck is too apt to be a serious disaster because cars are forced from the structure to the ground.



PECULIAR INSTANCE.
In the upper picture one car lies on the roof of a building. In the lower a crushed vestibule is shown.



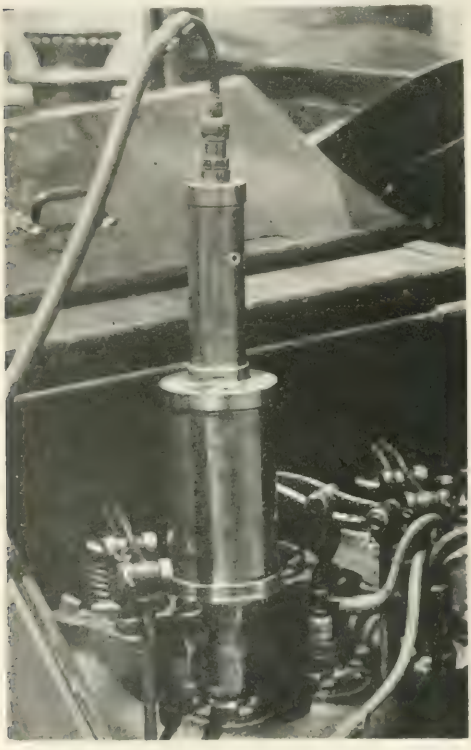
TO MEASURE BURGLAR'S STRENGTH.
Ingenious device for recording force employed by thieves in house-breaking, used in connection with the Bertillon system of identification.

DEAD SEA INCREASING IN SIZE

CONTRARY to general belief the Dead Sea in Palestine, without question the strangest sheet of water on the face of the globe, is gradually increasing in size. On an exploration tour recently made over this historic inland sea, proof of the encroachment of the waters upon the land was seen at every hand. On the western, southern, and eastern shores partially submerged forests of large trees were seen standing in the death-dealing waters. Maps of this region made a couple of decades ago show a large island about half a mile from the shore near the northern extremity of the lake. This has now been totally submerged. The Dead Sea is some forty miles in length and ten miles wide at its greatest breadth, resembling an oval in design. Its surface is no less than 1,300 feet below that of the Mediterranean. Its waters are so salt and bitter that fish cannot live in them. Indeed, the density

DEAD SEA INCREASING IN SIZE.
Shore of famous body of water that is constantly changing its line.

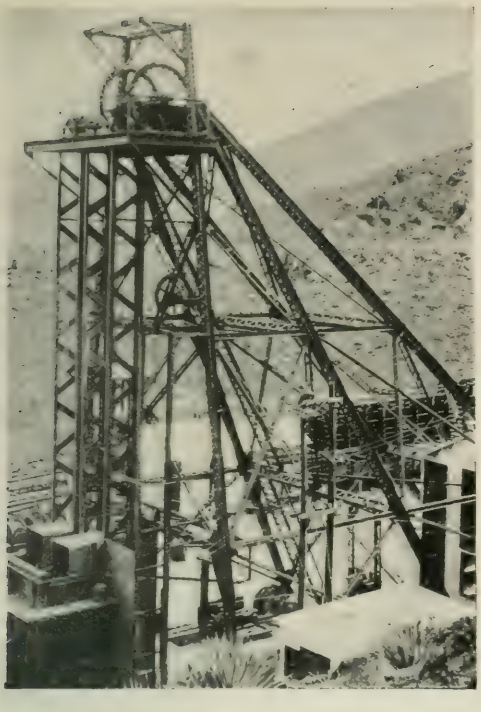
of the water is remarkable. It contains twenty-three per cent of solid matter and is, bulk for bulk, heavier than the human body, which makes it impossible to sink. The Dead Sea basin is very rich in minerals, containing salt, bitumen, sulphur, phosphates, copper, some fine marble, and probably oil and coal. The Turkish government has sold the rights to exploit these minerals to a foreign syndicate, $350,000, it is said, having been paid for them.



AUTO PUMPS ITS OWN TIRES.
Pump arrangement for attaching to auto engine so that tires may be inflated without hard hand labor. Ingenious and useful.

AUTO PUMPS ITS OWN TIRES

TO save the motorist the unpleasant task of pumping up the tires of his machine, a device has recently been placed upon the market which is attached to the engine and does the inflating automatically. It consists of a pump which is attached to one of the engine cylinders by removing the spark plug and screwing the pump in its place. It is claimed that the largest automobile tire may be inflated by this device in five minutes, only pure air entering the tire and no injurious gases. The pump is



ORE BEDDING DEVICE.
Machine for placing layers of various ores in cars for the smelter.

small, being readily carried in the ordinary toolbox and occupying no more space than the ordinary hand pump.

ORE BEDDING DEVICE

IN order to get a proper mixture of ores for the smelter, a western copper mining company uses an exceedingly ingenious device which operates as follows:

The ore is hoisted from the various levels of the mine in automatic dumping skips, and as the ores on the different levels are of varying qualities it is possible to secure a good fluxing mixture by filling the ore cars with a certain proportion from each level. This is done very economically by dumping the ore into the belt conveyor, which leads directly from the mouth of the shaft to a trestle built over the railroad tracks. On this trestle runs a small engine which is connected with the belt conveyor in such a way that as the engine runs up and down the trestle it deposits a layer of the ore evenly in each car. After the proper proportion of one sort has been deposited in the cars, the mineral from another level of the mine is hoisted and dumped into the belt and the operation proceeds as before.

BULLDOG IN VALISE

THE owner of a valuable bulldog was afraid to trust his pet in the baggage car when traveling and in order to carry it into the Pullman or day coach he devised the clever ventilated gripsack in which his dogship was trained to curl up and keep still. As the illustration shows, the valise has a square of wire netting sewn inside at either end and a corresponding square is cut in the leather above it, the upper edge remaining uncut to serve as a hinge. This flap can be raised as shown or it can be lowered when the valise is being carried on the street, when it presents the appearance of an ordinary piece of baggage.

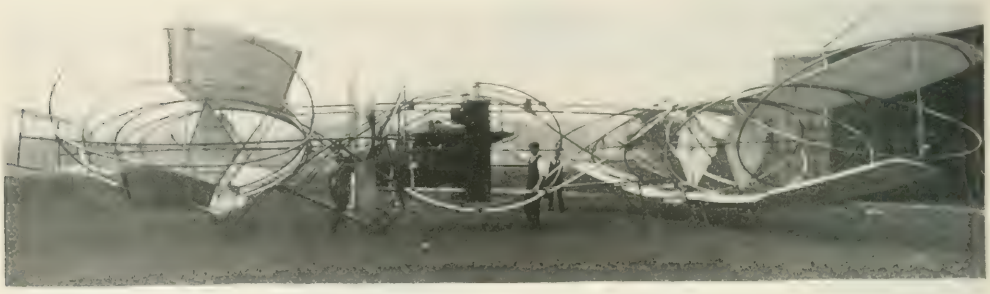
DOG IN A HANDBAG.
One owner's arrangement for carrying his pet on railroad trips without putting him in the baggage car.

KITES FOR WIRELESS.
United States signal corps' aerial messenger that bears a wire aloft for transmission of wireless telegrams.

INSTRUMENT TESTS HEARING

BY the invention of the principal of a school in Trenton, New Jersey, the backwardness of school children through defects of hearing will be effectually remedied. A little machine perfected after several years of experimenting makes it possible for any one to test the hearing of a child so as to tell accurately the exact power that the boy or girl possesses to catch sounds and understand the words of the teacher.

The little machine consists of a metal box about four inches square. The interior mechanism is made up of a little bell struck by a hammer. The bell when struck gives forth a silvery sound of a strength varied at the will of the operator. The height from which the hammer falls is regulated by turning a thumb screw and so the sound is increased or



THE LARGEST AEROPLANE.
Machine that weighs a ton and has a plane expanse of 1,000 feet. It is expected to carry six people, according to English builder's claims.

LARGEST AEROPLANE

THE accompanying illustration depicts the mammoth aeroplane which has been built by Lieutenant Seddon, an English naval officer, at Dunstall, near Wolverhampton, in England. The machine, which is twice as large as a Farman biplane and weighs about a ton, is propelled by two eighty horse-power engines, and its planes cover an area of 1,000 feet. The feature which particularly distinguishes the Seddon biplane from all others is that the parts customarily made of wood and wire are all steel. The framework consists entirely of steel tubes, which are arranged between the upper and lower planes in huge elliptical shapes. It is estimated that it will carry five or six people.

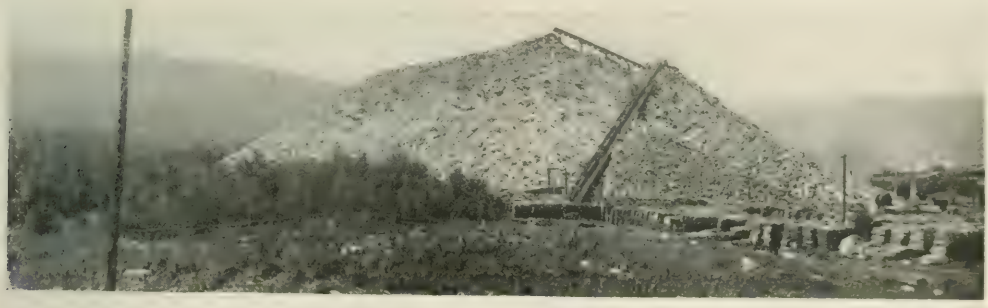
INSTRUMENT TESTS HEARING.
School teacher's invention for trying children's powers for the sake of proper treatment. Many a child who is considered stupid is found to be only deaf.

diminished as the test is made upon a given subject.

The sound passes to the ears through stethoscope tubes. At first the hearing is tested with the loud note and as the regulating wheel is turned by the operator the sound becomes fainter and fainter until it is perceptible only to those with the acutest powers of hearing. An index points to various numbers as the wheel is turned and as the child indicates that the sound is still heard so the index registers until the exact point where the sound becomes inaudible is reached.

Either ear can be tested separately or both at once. The test can be made by the person listening if he wishes. So rapid is this instrument in its work that the children in school can be tested at the rate of one a minute.

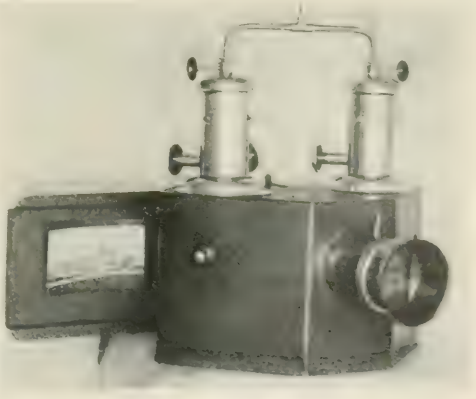
GARDEN ON COURT-HOUSE ROOF.
Novel place chosen by Edward Swift of London police for cultivation of his favorite flowers.



LARGEST WOODPILE IN THE WORLD.
One manufacturer's surplus as piled up at Berlin, N. H. The pile contains about 75,000 cords and is claimed to be the largest heap of the sort that exists. If is certainly an unusual sight.

MAGIC-LANTERN FOR SHOWING PICTURE POST CARDS

A SCIENTIFIC toy, with seemingly great possibilities, has been placed on the market by a British firm of lamp manufacturers whose invention it is. The apparatus is a kind of magic-lantern, but it will reproduce any picture-post-card or other picture and throw a brilliant view on a screen about the size of an ordinary sheet, bringing out the detail and all the colors of the original. As will be seen from the accompanying illustration the apparatus is worked in practically the same way as the magic lantern—that is, the picture to be exhibited is first placed in an ordinary slide.



SHOWS PICTURE POST CARDS
New English lantern that projects flat pictures upon the screen, and that will show the view on a post-card or photograph, many times enlarged.

TRAP FOR HONEY-BEES.
Odd structure of screen for experiment in fertilization of clover by the honey carriers.

NOTHING LIKE THE BUMBLEBEE

THIS picture shows a clever experiment. As will be seen, it represents a simple enclosure of wire net, at one end of which is a box hive. The whole affair is easily removable from one part of a field to another.

A few dozen honey bees were put into the box—the latter being so made that the insects had free admission to the inside of the enclosure, but could not get out of it again. It was desired to find out whether they would fertilize the clover within the enclosure. As a result, it was found that they did so to some extent, judging from a small crop of clover seed subsequently developed on this restricted area.

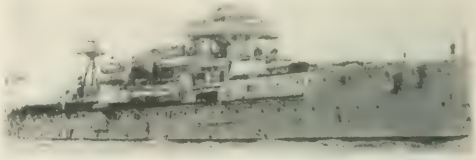
The fertilization accomplished, however, was very imperfect. On the other hand, when bumblebees were put into the hive, they attended to the fertilizing business in the most thorough and complete manner, every flower head bearing seed.

From these experiments it was ascertained, in the first place, that clover is fertilized to a small extent without the agency of any kind of bee—presumably by the help of other insects. Secondly, that honey bees will do the job in a sort of way. But, finally, that only bumblebees are able to accomplish the task with thoroughness—thanks to the extra-long proboscis with which the latter species is provided. Hence it will be understood why the government recently sent a lot of bumblebees to the Philippines, to give encouragement to the growing of clover in that archipelago.

FLOATING BRIDGE.
Odd structure on Canadian lake that rests on floats of logs anchored with stone

FLOATING BRIDGES

LAKE Chemong, one of the Kawartha Lakes series in the highlands of Ontario, is crossed by a bridge that the municipality built after a rather unusual plan. It is a floating structure, with a framework of logs which rests upon the water, anchored at intervals with stone and floored over with double planking.



DOING AWAY WITH FUNNELS.
How a modern warship would look if robbed of stacks and masts according to recent suggestion.

The bridge has a draw and thus serves all the purposes of a much more pretentious structure. It is a mile long, has been in use for fifteen years, and has proved very satisfactory both in the way of service and from a wear-and-tear point of view.

Another floating bridge, at Capilano, near Vancouver, B. C., has this difference, that it floats in the air. It has no moorings except at the ends and therefore swings freely, every motion of the body in crossing communicating itself to the structure, which or course is used for foot-traffic only. It is built on the swing-cable plan and substantially floored. The bridge is 410 feet long and hangs in the air 200 feet above a roaring mountain torrent through a wild canon. It is quite safe, however, and affords a good example of simplicity in suspension bridge construction although it is more of an oddity than a pattern demonstrating practical principles.

WATER POWER WITHOUT DAMS

A NEW invention which is intended to render available the power from streams without interfering with navigation by the building of dams has recently been patented by a Californian. The new device consists of a barge equipped with a novel wheel and operated by the water as it runs through the V-shaped flume which forms part of the device. The inventor describes it as follows:

The new current motor consists of a floating flume device, using a system of folding water wheels that are actuated by the gravity flow of water. There may be two or more wheels of any size, depending upon the amount of power to be developed. The wheels have hinged

TRAILER FOR A MOTOR CAR.
Two-wheeled conveyance, for baggage or merchandise, that will follow a car readily around corners.

vanes, and so arranged that they are placed in position, held in position, and thrown out of position by the action of the current, therefore offering practically no resistance on the one side. The power is taken up through a system of shafting to the pump or electric generator. The motor may be constructed of wood or sheet steel, over suitably constructed and trussed frame, having air-tight compartments where ballast may be placed to submerge the wheels to a proper depth. The motor is anchored from the front in three places. It rises and falls with the stream, making the strain nearly the same at all times. There is also a debris and ice deflector on the front to ward off drift and ice.

The flume of this motor is five times wider at the front or intake than at the outlet, and, as the model shows, while working, the water travels much faster in the flume than in the gravity flow of streams outside of the flume, making

NOVEL CURRENT MOTOR.
Invention for utilizing the flow of streams for the production of power.

rapids, and it is expected that the swift flow of water will have a tendency to keep the ice cut out of the flume. The motor is so constructed that it may be submerged to a proper depth below the ice line, so that it will be just as efficient in winter as in summer.

These motors can be anchored in navigable rivers and streams without interfering with navigation and where it would be impracticable to build a dam.

UNUSUAL MARINE MISHAP

AS the German steamship *Wotan*, laden with lumber and creosoted piling was standing out of Puget Sound recently, she suddenly took on a heavy list, to the alarm of her crew, who believed she was about to turn turtle. She was with difficulty brought to an anchorage and considerable of her deckload of piling had to be discharged before she began to rise to an even keel.

The underwriters then took charge and insisted upon a rigid examination into the cause of the mishap; and while the vessel's predicament continued somewhat of a mystery, it was thought to be due to the fact that one of the water-ballast compartments had not been properly filled prior to leaving her loading port.

MYSTERIOUS LIST OF VESSEL
Curious behavior of German ship that was early in fact explained by insurance investigators.

LONDON WALNUT MARKET.
The place where English walnuts are marketed. Thousands of tons are furnished by growers each year to a nut-hungry world.

ENGLISH WALNUT MARKET

ENGLISH walnuts are favorites the world over, thousands of tons of them being consumed in the United States at Thanksgiving and Christmas and in nut candies. Probably no country consumes as many nuts of all kinds as does the United States, importations coming from all parts of the world.

The English walnut trade gives a living to thousands of people, men, women and children during the regular walnut season. After the nuts are gathered they are taken to a central market in London, where they are sorted and hulled. Then they are cleaned and prepared for shipping in great bags. They are brought to market in huge baskets, great dray loads of them, piled tier upon tier. The work of hulling and sorting is taken up even by old people, who are unable to do hard work, but whose fingers have not yet lost their cunning. They sit in rows around the sides of the market building, with the baskets in front, the cleaned nuts going into one basket and the debris into another. Husky young men bring around supplies of more nuts and take away the cleaned ones. The work is all done by hand. In the United States pecans and other nuts of the sort are cleaned largely by machinery and given a polish in a large rotating cylinder.

PORTABLE BED.
English army medical department's new device for providing wounded men with comfort

NEW TELEPHONE CABLE

A CABLE which is an improvement on all other submarine telephone lines and which is said to be 300 per cent more efficient was recently laid in Europe, between Abbott's Cliff, Dover, and Cape Grisney, and remained with its ends buoyed off the respective landing place in France and England until the P. O. cableship *Alert* arrived to complete the work by getting the ends of the eighteen nautical miles of cable ashore. By means of the new cable, the invention of Mr. Dieselhorst, and despite the fact that so much of the line is under water, it will be an easy matter to speak with perfect distinctness between Glasgow and Paris. The start was made off Dover, when the loose end of the cable and the buoy to which it was attached was wound inboard and then placed coiled up on a raft composed of three ships' boats. The

NEW TELEPHONE CABLE.
Big trunk connecting England and France that has "loading" coils which increase its efficiency greatly.

raft was then rowed to the shore, the cable being paid out all the time, until the end was landed. This was pegged down, the length between it and the sea being buried in a trench, to await connection to the land lines. The same process was repeated on the French shore. The new cable has what are called "papia" or "loading" coils made of iron. It has been found that these, introduced at intervals in a telephonic circuit, greatly improve the speaking conditions, and render possible a conversation through submarine cables over more than twice the former distance.

Measuring Heights.
Using new instrument of the forestry department for finding how tall are trees.

MEASURING TREE HEIGHTS

FOREST service experts often want to measure the heights of trees. A simple little instrument has been devised for the purpose, an essential feature of which is a "swinging circle." This on account of a suspended weight, keeps its level always, no matter what the position of the instrument, and is marked with a graduated scale. The operator stands one hundred feet from the tree. Holding the instrument to his eye, in such a way that the bubble of a small spirit level shows it to be horizontal, he looks through a hole in the outer case which surrounds the swinging circle. Then he brings the tree-top into the line of vision. The point at which the line of vision crosses the swinging circle is marked with the number of feet that is the height of the tree.

Remarkable Submarine.
Boat that operates diving and propelling mechanism without the aid of her crew.

MODEL SUBMARINE

THE accompanying photograph shows a most remarkable model of a submarine boat that operates its own diving and propelling mechanism entirely without either crew or outside assistance.

This model, named the *Sebada,* is an example of the work done at the Naval Academy at Annapolis by Midshipman Ellis S. Stone, who made the complete model in every detail. The submarine is four feet nine inches long and 10 inches in diameter at her greatest girth and the outside contour of the shell is built according to the most approved plans of present day submarine construction.

Inside of the boat is a carefully made miniature electric motor of about .08 H.

Circus On Bicycles
Once popular high machines used recently in novelty race near London, England

Birch-Bark House.
Curious summer dwelling made and used by Russian Yakuts, who live on the Lena River in Siberia.

P., which drives the propellers at a speed of 400 R. P. M. enabling the boat to make about four knots submerged and on the surface almost five. An auxiliary electric motor drives the mechanism for raising or lowering the diving fins and the boat can be set to go any distance in the testing tank up to 350 yards under the surface and come to the surface after it has gone the distance it was set for.

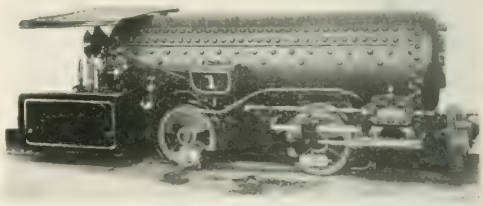
The power supplying the motors is secured from nine cells of storage battery, carefully fitted into the hold and the watertight hatch allows of charging them when exhausted. While the boat is of toy size and not intended for actual use, it has demonstrated many interesting facts about submarine action.

LONG WAGON BRIDGE

THIS bridge which reaches for two miles across lake Pend d'Oreille in the northern part of Idaho is said to be the longest wagon bridge in the world. It is built entirely on wooden piling. The lake, which is a beautiful body of water surrounded by dense coniferous forests and mountains, is very shallow near the city of Sandpoint. The Northern Pacific Railroad also has a bridge crossing the lake near this one, but it is built with modern concrete piers, though an earlier one was on wooden piling as is the one illustrated.

COMPRESSED AIR LOCOMOTIVE

IN many instances where compressed air is largely used for other service, as in drilling and similar work, the compressed air locomotive is utilized to special advantage and is powerful, compact and easily controlled. The accompanying illustrations shows a powerful compressed air hauling engine as utilized by a large asphaltum company. It was



Compressed Air Locomotive
Powerful machine used for handling heavy loads in factories and mines.

TWO MILE WOODEN WAGON BRIDGE.
Structure that crosses Lake Pend d'Oreille in Northern Idaho, built entirely on wood piling.

designed for a narrow gauge of only two feet and has drivers only twenty inches in diameter. It has a tractive force of 1,800 pounds and weighs complete a trifle over four tons.

The compressed air locomotive works in a similar manner to a steam engine, air under pressure instead of steam driving the pistons.

This engine has an air tank which takes the place of the steam boiler of an ordinary locomotive but the air tank of a compressed air locomotive must have a large storage capacity and high pressure which is, in this case, 800 pounds per square inch. The working pressure is, however, very much lower—in this instance the air being supplied to the cylinders at a pressure of 140 pounds per square inch. The compressed air engine has the advantage over steam locomotive for intermittent industrial service in utilizing no energy except when in operation, it being unnecessary to maintain steam pressure by the consumption of fuel whether the engine is in operation or not. In some cases the danger from fire and explosion of gases as well as the absence of smoke make this form of haulage motive especially desirable.

LAUNCHED READY ARMED.
Unusual scene of full armed torpedo destroyer taking the water at Southampton, England.

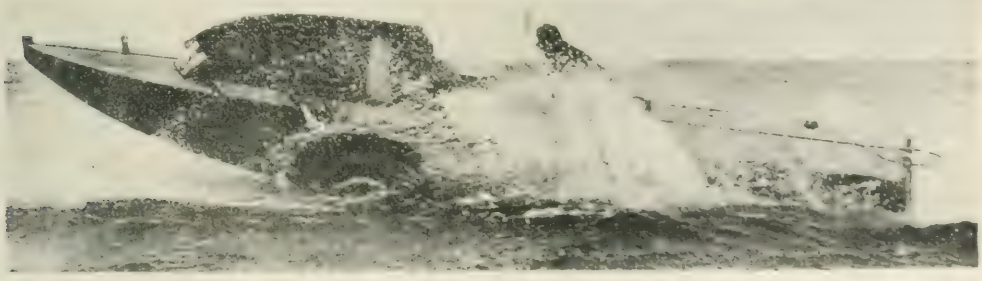
THE "80" BUTTERFLY'S MARK.
Strange numbering on wings of a South American butterfly that takes its scientific name from the fact.

ARMED AND READY

A LAUNCH of a vessel under unusual circumstances took place recently at Woolston, Southampton, England, when the torpedo destroyer *Savage* successfully took the water—with her masts, funnels and guns all in position—from the yards of Thornycroft & Co., Ltd. The accompanying picture shows the vessel.

MECHANICAL APPLE PARER

AMERICA ships large quantities of dried apples to France, where they are used for making cider. If properly dessicated they contain all the elements of fresh apples and may be preserved in barrels many years. A pound of dried apples contains as many constituent principles as four pounds of the fresh fruit.

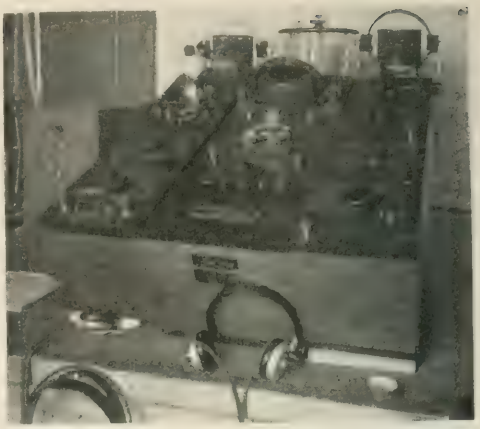


A SWIFT FRENCH HYDROPLANE IN ACTION.
A thirty footer with four cylinder engine of 156 horsepower that recently made a speed of forty knots at [illegible]

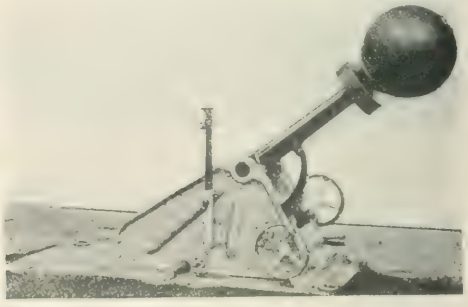
GAS SOLD IN BOTTLES

THE notable revival of gas lighting, caused by the invention of the incandescent gas mantle, has now a strong ally in the introduction of liquified gas—called "Blau-gas," after the German inventor of the system—sold by the pound in steel "bottles" which the customer may have delivered at his home. In some newly laid-out suburban residence districts, where the gas mains have not yet been put in, this "liquid sunshine" solves the problem of domestic lighting and heating. The steel bottle in which the gas is delivered—a receptacle about eight inches in diameter and four feet high, containing twenty pounds of the gas is stowed in a steel closet just outside the house, and connected through an expansion chamber to ordinary house piping. The closet has room for two of the bottles of gas, one being a reserve, to tide over when the first bottle is emptied.

The liquified gas is a non-poisonous mixture of hydrocarbons of high calorific value—said to be three times that of ordinary city gas—giving a very white light from mantle burners and increased power when burned in the gas engine. No meter is required. The gas is simply bought as needed, at ten cents a pound, and one pound will keep a 60-candle-power light burning for seventeen hours, or a gas-stove burner going at full flame for two and a half hours. The system is simpler than any private gas-generating plant, the only attention required being the connection of a fresh bottle once in so often—a minute's work with a wrench. It renders the householder independent of the gas and electric light companies, and at the same time it helps the latter by giving them a means, temporary or permanent, of supplying their outlying customers—whom they could not otherwise serve—with light, heat and power.

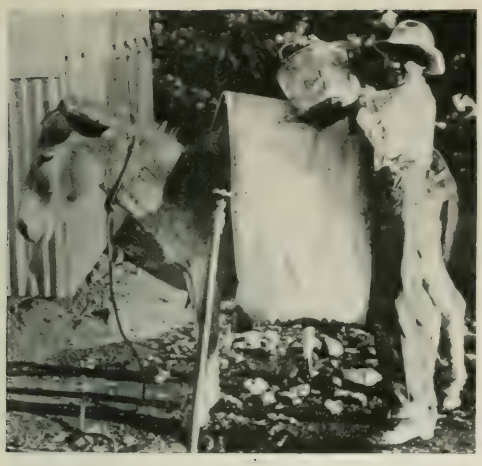


Multiplex Wireless Apparatus.
Installation in the Metropolitan tower in New York that receives three separate messages at one time.



Big Shell for a Little Gun.
New English piece that will fire missile larger than its calibre but attached to a rod that enters the muzzle.

Testing the Tear-Duct.
A drop of pungent liquid can be detected in the throat by taste if dropped in normal eye.



BAGS FULL OF WATER.
Method of transporting necessary fluid on burros in Arizona mountains.

JUST A DROP IN THE EYE

FROM the inner corner of the eye there runs a little pipe clear down into the throat. It is called the "tear

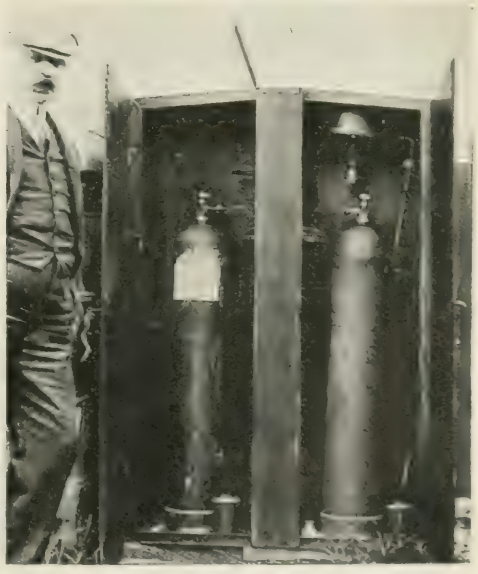
HEAD OF A BIG SALMON.
Big fish for England caught with a rod on the Tay. It was a male weighing sixty-three pounds.

duct." In fact, this is the way in which the watery fluid provided by nature for washing the eye eventually flows off. If it did not go by that channel, it would overflow upon the cheek, and we should be continually crying.

One can see the mouth of the pipe, at its upper end, by examining the eyelid at its inner corner. And, if one would be convinced that it really does lead into the throat, one has only to put a drop of some harmless fluid with a strong taste into the eye with an eye-dropper. The flavor of it will be plainly distinguished in the back of the mouth almost immediately.

WATER BY THE BAG FULL

IN the mountains of Arizona, where the burro-trail is the only way of getting about, a canvas bag slung over the back of one of these diminutive burden bearers is the recognized method of carrying water. The bag is made of a very closely woven fabric, the corners being reinforced with leather. There is an opening at the top on each side, something like a pocket, and into this the water is poured, about ten gallons to each side. The water is drawn out from the bottom through a cow's horn, set firmly in a piece of leather and plugged at the small end with a wooden stopper. There is just about enough leakage and evaporation to keep the water cool on the hottest Arizona day, and, as the weight hangs low on both sides, this is one of the best ways of packing water by burro, as yet devised. Carrying water in a sack seems an odd method in this day and age but it is a welcome idea to those who are at any time dependent upon it.



BOTTLES OF LIQUID GAS.
Two containers of Blau gas, which can be shipped and expands into usable form when released.

STORE ROOF THAT MAKES A PLEASURE GARDEN.
One mercantile house of California furnishes a place where children may play and mothers take their ease and rest, on the top of a big building but in perfect safety.

STORE MAKES USE OF ITS ROOF

A CALIFORNIA department store makes use of its generous roof as a comfortable resting place with a number of canvas pavilions for those who desire the shade, and plenty of chairs for those who prefer a sun bath. Flowers and palms in boxes make it very pretty, and merry-go-rounds, swings and see-saws have been provided for the children. The safety of the little ones is assured by the presence of an attendant and, moreover, a six foot wall encircles the roof so that they cannot possibly fall over. Thus the mothers who bring their children when they are shopping can leave them while their purchases are being made, and many give this store the preference for that reason. The public library is located on one floor of this department store, and the roof garden is a favorite resting place for readers as well. It makes an attractive feature for the store and is a delightful place for the children especially.

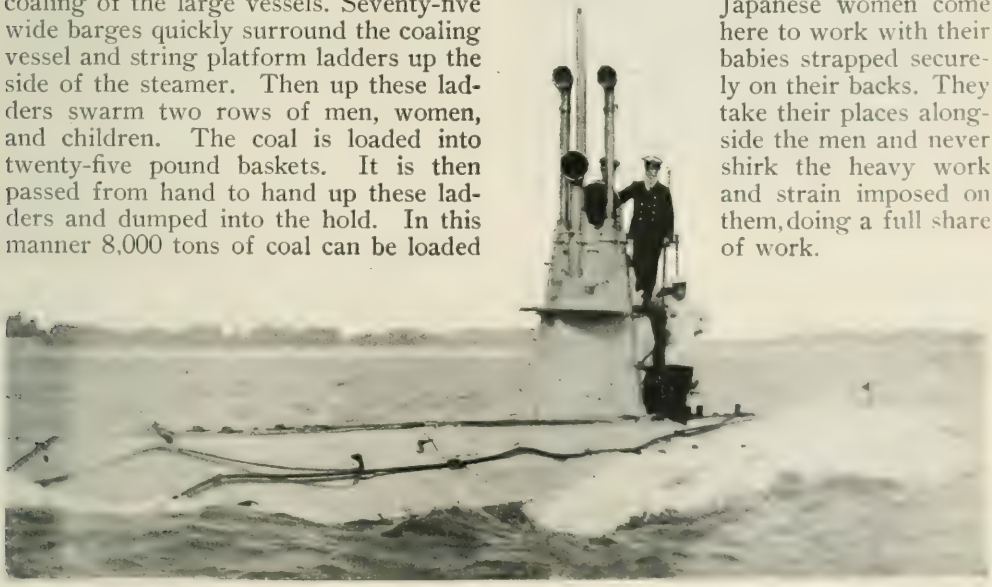
Modern stores are continually adopting new features of this sort, looking to the comfort of visitors. Many have play-rooms in which children have free use of expensive toys. It has been suggested that the department store promises to become the mother's club.

AEROPLANE AND SUBMARINE AT ISLE OF WIGHT.
Remarkable photograph taken near English coast, of two products of modern inventions that are destined to change warfare or abolish it in the near future.

CARRYING COAL TO LINER BY MAN POWER.
Japs, men and women, load big steamers with fuel at Nagasaki, passing the coal from hand to hand in bags from lighter to hold.

COALING AT NAGASAKI

AT Nagasaki, one of the leading Japanese ports and naval stations, an attractive feature to the visitor is the coaling of the large vessels. Seventy-five wide barges quickly surround the coaling vessel and string platform ladders up the side of the steamer. Then up these ladders swarm two rows of men, women, and children. The coal is loaded into twenty-five pound baskets. It is then passed from hand to hand up these ladders and dumped into the hold. In this manner 8,000 tons of coal can be loaded in less than twenty-four hours. The average wages of these laborers vary from five to fifteen cents a day. So eager are the natives to make this pittance that many of the Japanese women come here to work with their babies strapped securely on their backs. They take their places alongside the men and never shirk the heavy work and strain imposed on them, doing a full share of work.

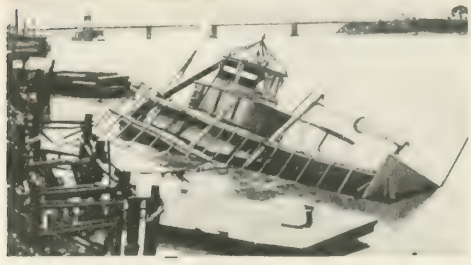


ONE OF BRITAIN'S NEWEST SUBMARINES.
Type called in the English navy A1, which is a formidable improvement on older vessels. Only the tubes and conning tower show above water when she is attacking.

BIG CARTS FOR LOGS.
Pacific coast invention for transporting heavy timbers from cutting ground.

TOWN BUILT ON A BULKHEAD.
East San Pedro, California, built of driftwood and similar materials on bulkhead reaching seaward.

BOY-SCOUT DRILL.
Exercise in mounting a wall, as taught to lads who are learning soldiering.



SCENE OF BRAVE DEED.
Wreck of Missouri River steamer where 150 lives were saved by pilot and engineer who stuck to to their posts till vessel sank.

USING HUGE LOG CARTS

THE photograph shows one of what is undoubtedly the largest log carts on the entire Pacific Coast. The wheels are twelve feet in diameter and thirty-six feet in circumference, while the big wooden hubs and spokes are capable of sustaining an immense weight. The felloes are also of wood, but are surrounded by very heavy steel tires. The axle is made partly of tough, strong wood, and of steel. The log cart is used principally up in the densely wooded regions of Klamath County, Oregon, where extensive lumbering industries are carried on. Logs are swung by a strong chain to the axle about midway between the two wheels. They are nearly equally balanced—the hind end, or ends, lightly dragging and thus requiring less force to move the heavy weight.

TOWN BUILT ON A BULKHEAD

ONE of the quaintest towns on the Pacific Coast is the settlement of East San Pedro, recently annexed to Los Angeles, California. It is composed of a hundred or so "shacks," many of them built by squatters from drift wood, fragments of wrecked vessels and all kinds of flotsam and jetsam.

The main street is the centre of the bulkhead which extends seaward from the mainland a mile or so to "Dead Man's Island," protecting the channel of the inner harbor. This street, which is a rugged length of sand and projecting rocks, boasts the name of United States Avenue, and is without sidewalks or curb. They are not missed, however, for the pedestrian can take the middle of the road without danger from automobiles. The houses are built with their front doors overlooking this thoroughfare, while their back doors overhang the channel, most of the settlement being built on piles.

These squatters, mainly fishermen and 'longshoremen, have been frequently threatened with eviction, and several times they have been burned out by disastrous fires, but so far they have stubbornly maintained their rights in their unique little homes and seem to enjoy their methods of living.

MUNICIPAL ABATTOIR A SUCCESS

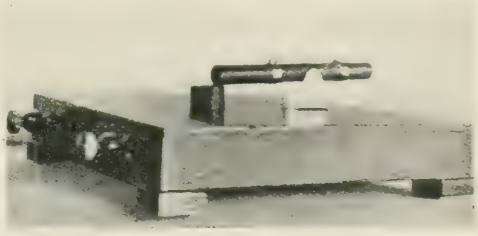
THE municipal ownership and operation of an abattoir and reduction plant at Paris, Texas, has proved so successful and satisfactory to the people and officers of that city that the plan may become popular with municipalities. It is claimed by the men who brought about the establishment of this municipal plant that its operation has benefited the people of the city in many ways. The most important result is the general improvement of health conditions, due to the fact that none but absolutely healthy animals are now permitted to be slaughtered and that the most modern sanitary methods are employed in handling the carcasses and serving the meats and their products. It was the first municipal slaughter house to be established in the United States. Under the new arrangement the municipal authorities of Paris require that every animal that is to be slaughtered shall first undergo a thorough inspection. No slaughtering is permitted except at the municipal plant. Nominal inspection fees are charged which go to paying the operating expenses of the plant. It is not run as a money-making concern. The equipment of the abattoir is modern as to sanitary arrangements. Cleanliness in handling the carcasses and meats is rigidly observed. The plant was erected at a cost of $10,000, which sum was raised by a bond issue.

NOVEL SAWING OUTFIT

A GASOLINE tractor truck and sawing outfit has been designed and constructed at Coburn, Pa., as shown in the accompanying illustration, the saw being mounted on a portable framework and carried on the truck. When reaching the place where the sawing is to be done it is removed from the tractor and belted to the gasoline engine. A portable gasoline tractor engine is seen in the accompanying illustration driving a forty-eight inch saw and developing from twenty-two to twenty-five horsepower. The engine can be operated with natural gas, gasoline, kerosene or California distillate, a special mixer being provided on each cylinder.

MUNICIPAL ABATTOIR.
Where a town kills its own cattle and swine for its own people.

PORTABLE SAW-MILL.
Useful combination of truck and sawing outfit.

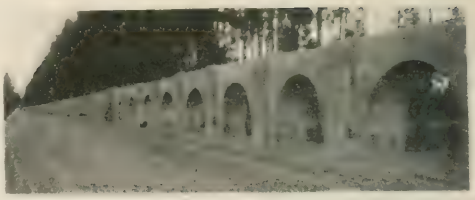


OLD MICROPHONE IMPROVED.
English inventor placed slide bar and clips upon it and made it very sensitive.

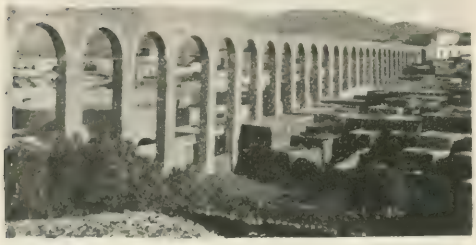
GOVERNMENT BALLOON HOUSE.
Omaha experiment station as seen from the balloon itself.

OLD MEXICAN AQUEDUCTS

IN many sections Mexico is a waterless land. There rain does not fall for months at a time. The streams, even the rivers run dry, and man and beast have to depend upon the rain water that has been caught and contained within the deep receptacles of the cactus, known as *visnaga*, the water barrel of the desert.



OLD MEXICAN AQUEDUCTS.
Heavy supports of water carrying flume in a waterless land.



OLD MEXICAN AQUEDUCTS.
Fine specimens of arches on which water was once carried.

I have seen the great Rio Grande, at both Laredo and El Paso, Texas, when, with the exception of a tiny stagnant pool gleaming in the midst of a sand bank, it was as dry as a bone. I have twice walked across the river dry shod.

On more than one of the railways of Mexico, on several of the branch lines—noticeably that from Durango out to Torreon—a special car has to be provided for the purpose of carrying water for both passengers and engine, since there isn't even the ghost of a water tank along the way. In many of the rural sections water is carted, or brought in skin bottles on the backs of burros, from twenty to thirty miles; often from some stagnant pool. More deaths occur in Mexico from drinking impure water than from almost any other cause.

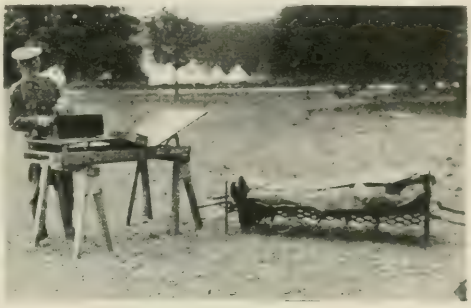
The cities and larger towns, especially those in mountainous sections, are blessed with fountains and with long lines of aqueducts, marvels of masonry, that bring the water over long distances from springs in the mountains. Some of these aqueducts are centuries old. They were built by the Spaniards and of a concrete that is well nigh indestructible.

PANORAMIC VIEW OF THE
Home ships of the greatest naval power on earth as they

A Pet Giraffe.
Small animal in Paris zoo shows real beauty of head usually considered ugly.

Solid arches of masonry support them where the water troughs extend over deep depressions of the earth.

Among the most noted of the aqueducts of Mexico are those at Zacatecas and Queretaro and that of San Cosmos, Mexico City. So massive are the arches of the aqueduct at Queretaro that the trains of the National Railway easily run through one of them. As Mexico City now receives its water supply in an up-to-date way, through the regulation pipes, its aqueducts have either been demolished for material with which to pave the streets or else left to become picturesque ruins. Enough of the old San Cosmos aqueduct remains to show what a gigantic piece of masonry it was. It extended for over twenty miles and there were over a thousand massive arches of stone and brick. This aqueduct was begun in 1603 and completed in 1620. For those days, apart from the skill displayed in their erection, these aqueducts were wise provisions. They not only brought the water from springs in the mountains that were exceptionally pure, but brought it above the level of the city drainage, thus preventing the contamination of contact with poisonous matter.



Portable Operating Table.
English invention for emergency or battlefield use.

PORTABLE OPERATING TABLE

ABOVE is illustrated an interesting device in an extension-table built on the pantograph principle for use of wounded men in army service, in field or hospital.

BRITISH COMBINED FLEETS.
looked while waiting for inspection by the English king.

Big Filtration Plant.
Scene in Springfield, Mass., plant claimed to be finest in America.

SPRINGFIELD FILTRATION PLANT

THE picture shown above represents a section of the great filtration beds of the filtration plant of Springfield, Massachusetts, claimed to be the most perfect filtration plant in the United States. This plant represents a total expenditure of $2,000,000, and was just put into use by the city of Springfield during recent months. Since the starting of the work on this great filtration plant two years ago 1,000 men have been continually at work in bringing the plant into its present stage of completion. The filtration beds are fed from a reservoir holding over two billion gallons and their capacity is slightly over 11,000,000 gallons of water a day.

The filter beds present a filtration area of five acres and are of the cement steel covered type. The patches of light in the picture are from the manholes through which the gravel material used in filtering may be sent through chutes to the beds below.

The water is aerated after leaving the filters and after traveling over thirty miles is delivered in thirty-six inch mains at Springfield under a pressure of 200 pounds to the square inch.

Teddy Bear's Rival.
Model of Caesar, the late King Edward's dog, now a favorite toy of children in England.

HUGE NEW STATION

A NEW depot is being planned for the city of Cincinnati which, if built in accordance with present plans, will cost thirty million dollars and cover six entire blocks. It will provide an entrance under one roof for every railroad and traction line that enters the city. The buildings will be of concrete and steel and terra cotta and the style of architecture will be the French renaissance. The principal building will be fourteen stories high and will cover four hundred by two hundred feet of ground. A central tower ninety by one hundred feet will stand five hundred feet high and contain twenty-two floors. These floors will be used for offices. An arcade one hundred feet wide is to lead from one of the principal streets to the waiting room, approached through a portal and facade. Along both sides of this arcade will be shops and stores. Just above the waiting room there will be four floors devoted to permanent manufacturing exhibits and five floors to offices in which the railroad and allied companies will find luxurious housing.

Huge New Station.
Design for proposed Union structure at Cincinnati which would cost $30,000,000.

HOT COUNTRY CHURCH

THE accompanying illustration shows one of the most peculiar places of worship in Mexico. From a distance it presents the appearance of a great shaggy pile of fodder. It is very simple in construction, being made of a framework of poles covered with thatch. The natives like to gather within this tiny chapel in the season when the tropical rains abound and listen to the raindrops pattering down on the thatched roof. Some of these little churches have been favorite resorts for the ladrones, who prayed for blessing upon their thieving

THIS IS A CHURCH.
One of peculiar type in Mexico that looks much more like a hay-stack.

STEAMER BUILT IN SIXTY-FOUR DAYS.
Record-breaking boat by English firm, taking to the water.

expeditions and for release in case they should be captured. It has not been so very many years since one could find, among the silver votive offerings, little chains and manacles as visible evidence that some fellow had escaped well deserved punishment in answer to his prayers.

BAMBOO CULTURE

IN an effort to encourage bamboo culture in America, and as a basis for more extensive experiments in the future, the Bureau of Plant Industry is distributing bamboo plants with a view to determining the soils and climatic conditions in this country which are best suited to them. In this country bamboo has been planted chiefly as an ornamental plant, being commonly grown for that purpose in Florida and California and some of the cotton states. In the San Joaquin Valley it is planted to considerable extent as a wind brake, for the protection of vineyards, orchards and truck farms. Not less than 10,000,000 bamboo fishing poles are imported into this country from China and Japan every year. There appears to be no reason why these should not all be grown at home, while the innumerable other purposes for which various species of bamboo are suited, make the attempt to introduce commercial varieties and to encourage their culture worth while.

BUILT IN SIXTY-FOUR DAYS

RECENTLY a remarkable ship-building feat was accomplished by a British ship-building firm on the Tyne, who succeeded in building and launching a large vessel in the short period of sixty-four working days. The vessel in question has a length over all of two hundred and fifty feet and a forty foot beam.

GROWTH OF BAMBOO.
Flourishing plants on experimental government farm in California where they are growing finely.

A Scene in China.
First glance at this modern railway station would not suggest the Celestial Kingdom.

CHINESE RAILWAY STATION

THAT China is gradually becoming westernized is obvious to all who have traveled recently in this remarkable empire. Factories built by Chinese workmen are springing up everywhere, while the modern machinery found in them now, in the majority of instances, has been installed by native mechanics and is operated by native workmen. In railway building, too, they are making great strides, the railway station shown in the accompanying illustration having been designed and entirely built by them.

WATER PIPE CUTS THROUGH HOUSES.
Mexican town uses novel method of supplying homes.

Remarkable Collision.
This smashup occurred near San Francisco recently and resulted in the complete demolition of two locomotives, which were also curiously tipped up on end as the photograph shows.

PRIMITIVE WATER SUPPLY

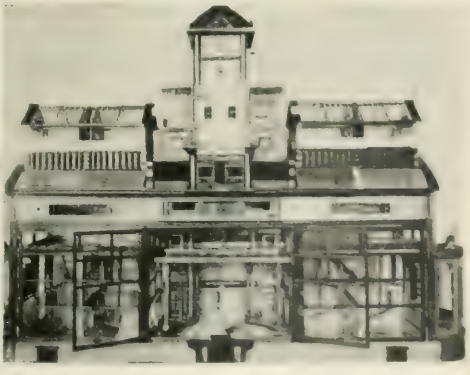
ONE of the most primitive water distributing systems remaining in Mexico is that of the city of Uruapam, state of Michoacan, Mexico. In constructing the wooden mains the course and surface grades of the streets were not always followed. If it was necessary to carry the main from one place to another and the street did not happen to be level and in a straight line the water main was run through the buildings and over the streets at elevations of several feet. The owners of the buildings and their occupants meekly bowed to the will of the authorities in the carrying out of this crude plan of distributing the water over the city.

HOTEL FOR BIRDS

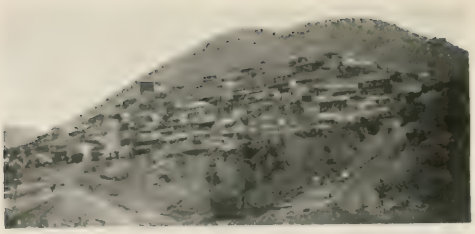
WHAT is probably the largest and most elaborate bird-cage ever made is that recently completed by Mr. Arthur E. Dunning of the clerical staff of the American embassy in Berlin. This mammoth cage for feathered pets has occupied four years of patient toil and is appropriately known as the Hotel Canary. It is seventy-five inches long by fifteen inches wide, and it has a height, including the tower, of fifty-one inches. It contains rooms for twenty-two feathered guests, and boasts in addition a winter garden with a fountain and two flower-rooms. The rooms are fitted with all modern improvements, such as electric light, running water, and so forth; while they are also provided with automatic feeding-dishes. In the winter garden are two lifts running to the second floor, and four sliding doors giving access to the surrounding rooms. The tower-room, which is not occupied by guests, is fitted with an electric chandelier and bell and is reached by means of a spiral staircase from the third story. This is a very novel form of bird house and one that is not likely to be widely imitated.

BIG CRANE IN SHIP-YARD.
Handles huge sections of repairs for ships. A whole broken stem lifted.

NEW CANAL SIPHON LOCK.
This illustration shows the construction of the new siphon lock on the barge canal at Oswego, New York. This siphon lock fills and empties by causing the water to run through the inverted "U" passages by exhausting the air in them, thus doing away with need of culvert valves by the siphon construction.



HOTEL FOR BIRDS.
Curious house built with many conveniences for accommodation of birds only.

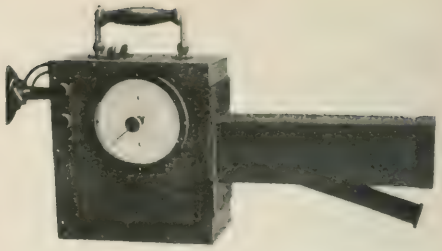


MINING A SLAG-HEAP.
Western town that is getting copper from old waste heap.

MINING IN A SLAG HEAP

AS the process of extracting metal from ore is perfected, it is found that what was formerly considered waste is now convertible into hard dollars. A good example of this is found in a western mining city where hundreds of thousands of tons of slag were run out of the smelter and allowed to stand for years because it was cheaper to leave an eyesore in the town than to haul the slag away.

Recently, however, it has been found possible to save the copper in this slag pile which amounts to one and one-half per cent. Accordingly it is now being loaded into ore cars to be re-smelted and as the slag forms a valuable flux for the ores it is an additional gain, besides the small percentage of copper.



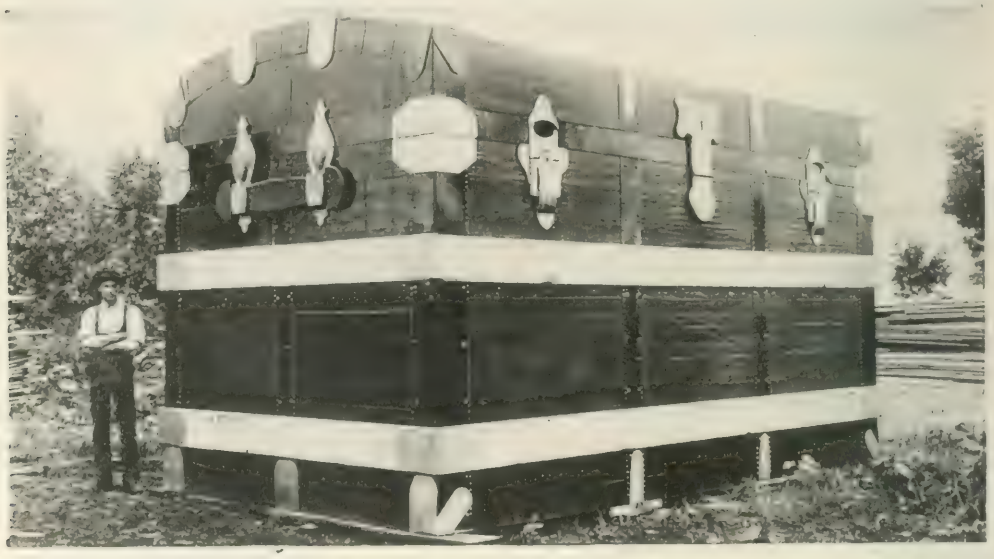
INSTRUMENT SHOWS US A MISTAKE.
Tells how little daylight we are using in our offices and homes.

ACCURATE PHOTOMETER

THIS ingenious little apparatus is based upon the principle that the relative intensity of two luminous sources, whatever they may be, seen through a yellow screen, remain constant.

By the aid of this photometer it has been calculated that notwithstanding the progress of hygiene and the science of arcitecture we have learned how to use only a very small fraction of the sun light, for lighting our buildings in the day time, even those that have the best exposure.

Contrary to accepted opinion, broad, and low windows do not give much more light than the ordinary window, as more or less horizontal light is of little importance. It is essential to catch the light from the zenith.



WORLD'S BIGGEST TRUNK.
Eighteen feet long, ten and one-half feet high and ten feet wide, it is used as an advertising exhibit at Fargo, N. D. It is later to be used as a camp-house.

New Torpedo Boat Launched.
United States latest destroyer taking the water.

Novelty in House-Building.
Curious house built of withes and unmortared rock for coolness sake.

LAUNCHING OF TORPEDO BOAT

THE second of a new series of torpedo boat destroyers, known as the "Sterett," was launched a short time ago from the works at Quincy, Mass., and is one of the new kind of craft upon which the U. S. Navy will depend to act in the capacity of scouts upon the high seas.

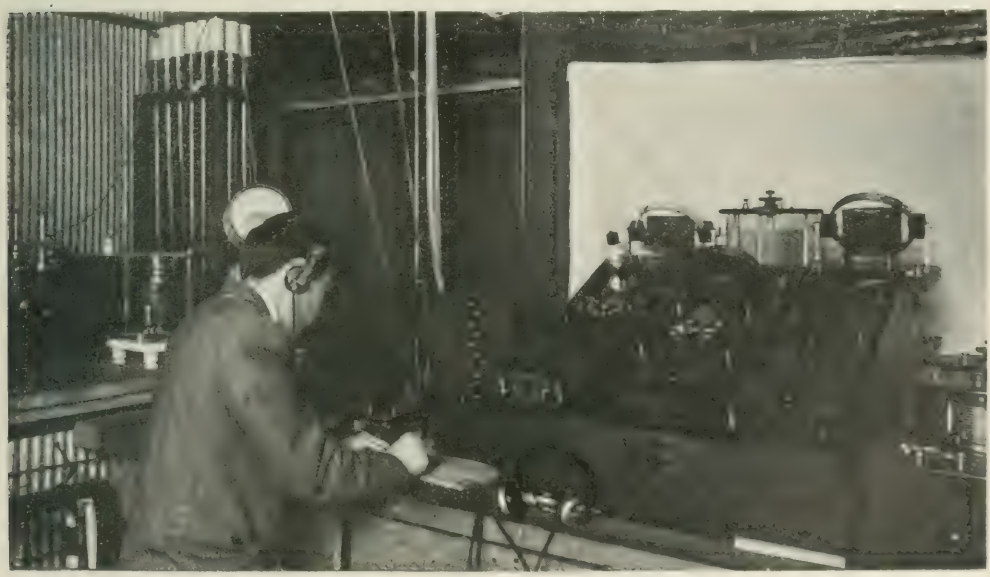
This type of boat has shown remarkable seagoing ability even in the heaviest kind of weather. It will be noticed the superstructure shears off gradually to the protected line, giving a wider sweep to the battery of guns and also presenting less space for the marksmanship of gunners of the enemy.

This boat promises greater speed than any torpedo destroyer that has been made.

HOT WEATHER ARCHITECTURE

A DECIDED novelty in house building is shown in the structure at the extreme right of the accompanying photograph. It is built of withes tacked on uprights in such a way as to form a hollow wall. The space between the double wall is filled with loose rock without any mortar or anything else to chink it, thus allowing the air to penetrate it freely. Above the roof is a canvas fly which cools the air as it passes under its shade.

This type of house with a porous wall is found in some parts of Arizona. The photograph was taken in the vicinity of the Laguna Dam. Others of the sort can be found in other parts of the hot country and the style is a favorite with some natives.



OPERATING ROOM OF BIG WIRELESS PLANT.
This gives an idea of what such a room looks like, though this plant, in New York City, is not the largest in the country.

SMOKE STACK THROUGH A HILL.
Economical method of one manufacturer who found out how to save by building a big chimney in novel manner.

FREE BATH FOR HORSES.
Western town's humane arrangement for cooling hard working beasts in hot weather. New plan that might well be followed.

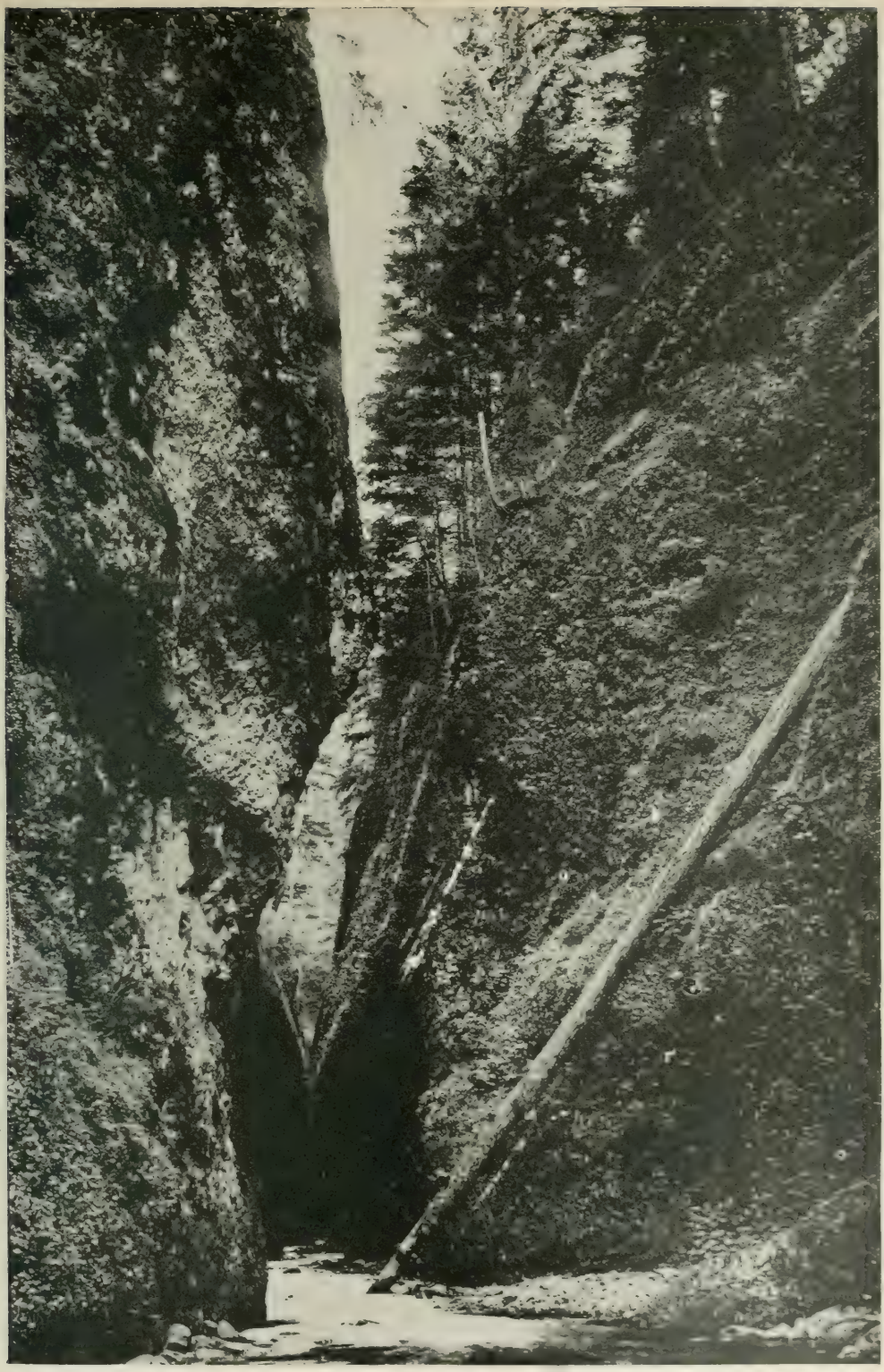
SMOKE STACK RUN THROUGH HILL

IN building the smelter shown in this illustration, it was found that money could be saved in smokestack construction by tunnelling under the adjacent hillock, running a shaft to meet the tunnel and setting an iron smokestack at the top of the shaft in a concrete foundation. Thus the chimney which is about one hundred feet high is half underground, and only about fifty feet of the iron stack had to be set up, rendering possible a lighter construction than would be otherwise feasible. The odd idea is entirely practical and caused a most decided saving over what would have been the necessary expense of a huge brick or steel chimney.

AUTO SWEEPER AND SPRINKLER

A COMBINATION automobile sprinkler and sweeper as used in Paris, France, is seen in the accompanying illustration. It is operated by a twenty-five horse-power motor which also supplies the necessary power for driving the sweeper under the center of the car as well as for operating a pump which forces the water from the tank through the nozzle at high pressure throwing a spray the full width of the street. This sprinkler-sweeper does the work of from three to four ordinary vehicles drawn by animal power and is swift and effective in its work. It cleanses without raising dust and is a vast improvement on older methods that have many faults.

AUTO SWEEPER AND SPRINKLER.
Parisian innovation that washes the pavements thoroughly as if they were scrubbed—as literally it does scrub them.



BEAUTIFUL ONEONTA GORGE.
Scene on the great Columbia River where nature is lavish of her beauties.

MULTNOMA FALLS OF THE COLUMBIA.
Exquisitely lovely veil of water that is seldom pictured.

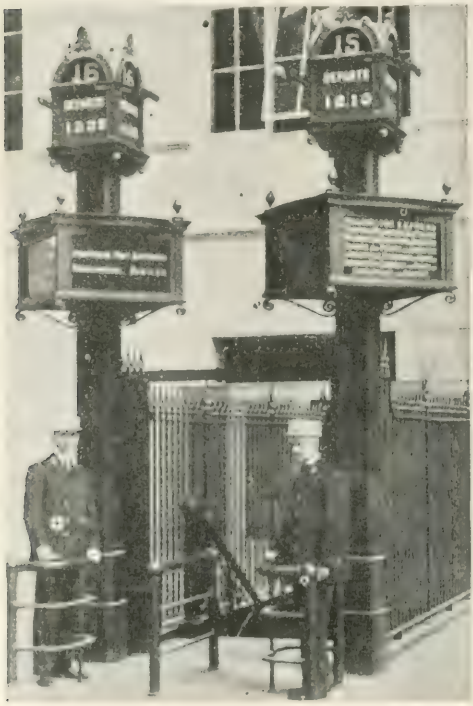
CURIOUS CAMERA TRICK.

Full length photo of operator taken as he holds the instrument, demonstrating the wide angle of a lens intended for taking sky-scrapers.

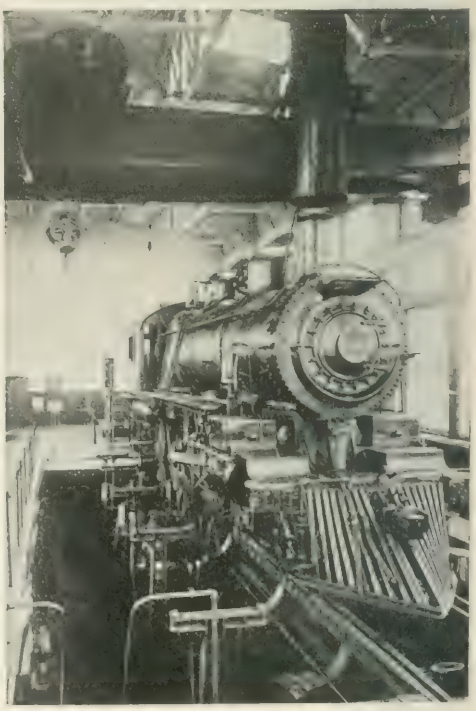
AUSTRALIAN STRIPPERS AT WORK.
Machines that take only the tops of the ripened grain, leaving the straw behind.

SKYSCRAPER CAMERA

THE wonderfully improved capacity of the modern lens is well illustrated by the famous firm of New York photographers, the Byron Company, who have designed and manufactured a special camera for taking photographs of tall buildings at close range—the Skyscraper Camera. With an ordinary instrument it is impossible at best to take a building higher than ten or twelve stories from across the street on the ground level, but with the skyscraper camera buildings of twenty-five stories or more can be taken at close range and from the street level and shown complete. With this camera also it is possible, by holding it in front of you, to take a full-length picture.



CONVENIENT TRAIN SIGNS.
New arrangement for announcing departure of trains by illuminated signs.



EXPERIMENTAL LOCOMOTIVE.
Engine at University Experiment Station whose wheels run on wheels instead of track below.

RECORD BREAKING COD FISH.

The larger of these two fish was five feet and six inches long and weighed sixty pounds. The boy will weigh more, but may never be much "longer" than the fish.

RECORD CATCH OF COD

WHAT is declared to be the biggest cod ever taken from the sea is that depicted in the accompanying photograph. The larger fish measured five feet six inches in length and turned the scale at sixty pounds. They were taken in the waters off Battle Harbor on the coast of Labrador by Newfoundland fishermen. Cod fishing, of course, is the principal industry of this colony, over $6,000,000 of this fish being exported annually. But the industry offers much scope for development. At present most of the exports are sent away as "dry codfish." The opportunity offers for "packing" of the cod in small, cheap cans, as is done with the salmon on the Pacific Coast.

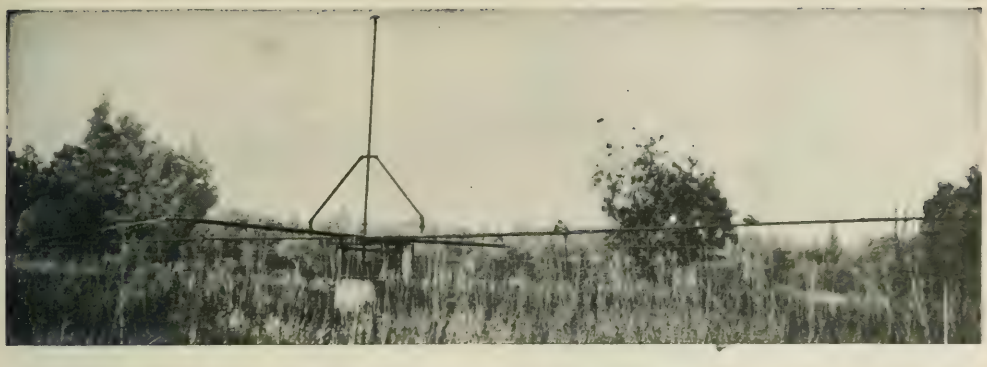
The small boy in the photograph seems to be quite overpowered by the company in which he has found himself.

USE OF CEMENT

ALTHOUGH the use of cement is on the increase in the United States, the price to the consumer is steadily falling. A low price for this building material will mean fewer frame houses and consequently less depreciation in property values in the years to come. The production of cement last year was no less than 64,196,386 barrels, valued at $51,232,979; for 1908 the production was 52,910,925 barrels, valued at $44,477,653. The increase was mainly in Portland cement, the output of natural and puzzolan cement forming but a small percentage of the total cement production. By reason of improvements in methods of manufacture, Portland cement can now be profitably sold at 80 cents a barrel. There are 103 Portland cement plants now in operation, of which 21 are in Pennsylvania, 12 in Michigan, 10 in Kansas, 8 in Ohio, 7 in New York, 6 in Indiana, 5 in Illinois, and 5 in California. Practically all of this enormous cement output was used at home.

GIANT JAPANESE SPIDER CRAB.

This denizen of the sea has a spread of twelve feet from tip to tip of his claws. The body is one foot across. The species is found in the ocean off Japan and sometimes at a depth of 1000 feet.



INGENIOUS METHOD OF IRRIGATION.
Clever device for distributing water on a growing crop, so that it will be like rain in effect.

NOVEL IRRIGATION SYSTEM

AN oddity in irrigation is the device shown in this photograph which consists of a system of pipes held rigid by guy wires and carried upon a truck which runs on narrow gauge tracks up and down the plot to be irrigated. This truck is connected with the water supply by a large hose. The water flows into the pipes which extend on either side of the truck a distance of about seventy-five feet and the outlets consist of short pieces of pipe at regular intervals which correspond to the spaces between the rows of growing things.

It was used in a California nursery to irrigate a growth of young palms, as it would be very difficult to drag a hose among the thousands of small trees, but by pulling the truck back and forth along the four hundred feet of track, an area of 150 by 400 feet could be irrigated with little trouble.

LIFE SAVING SIGNAL DEVICE

IN order to prevent the collision of railroad trains with its cars, a western trolley company has installed an ingenious signal system at the intersection of the railroad tracks. This makes it impossible for a car to cross them until the conductor goes to the front of the car, as a "stop" sign on a heavy iron bar projects right in front of the street car tracks, and the front of the car would be wrecked if the motorman tried to run past it. The lever which swings it aside is placed so near the railroad tracks that the conductor who operates it could not help seeing an approaching train while doing so. This danger signal is arranged so that when it is off one track it is on the other, thus warning the locomotive engineer that a car is about to pass. The device seems to promise effectiveness and is one more bar against crossing accidents.

EFFECTIVE CROSSING PROTECTION.
Huge danger signal, that cannot be missed by watchful enginemen, installed by a western trolley railway.

FATHER OF THE SILO.
First form of useful feed repository, as built by Mexicans.

REBUILDING HIGH BRIDGE

THE highest bridge in North America, which crosses the Pecos River in Texas, is being rebuilt without any disturbance of traffic. This remarkable feat is being carried out by order of the late E. H. Harriman, who directed that every one of the bridges on the entire system of the Galveston, Harrisburg & San Antonio Railway Company be replaced. The Pecos was the last bridge on the line to be built and therefore the last to be reconstructed. The trains are taken care of by a temporary wooden bridge, which was erected before the original structure was disturbed.

The new bridge will rest on concrete piers built in the river bed. In height the Pecos bridge is without a rival in this country and in fact there are only two in the world which are higher, one in Peru and the other in France. It spans the river at a height of 328 feet and has a length of 2,080 feet.

FATHER OF THE SILO

BURIED in the jungles of the State of Jalisco, western Mexico, there stands today three generations of the ancestors of an invention which has done more for the small cattle raiser of the eastern and middle western states of the Union than has any one other device yet put upon the market—the green-fodder silo.

First and most primitive of all, come the square adobe houses, raised off the ground and floored, also with the same clay. One of the photos presented herewith shows this first primitive silo very well. From the square box described above it was but a step to the cylindrical

HIGHEST BRIDGE IN NORTH AMERICA.
Striking appearance of the tall structure across the Pecos River, in Texas, which is being rebuilt.

TUG-OF-WAR ON HORSEBACK.
Exciting game as played by Mexican horsemen at a California holiday fete.

repository shown in the second photo.

After the square box and the cylindrical concrete "vase" come the real silos of Mexico. These are towers, as high, in many instances, as any of the silos of the United States, tapered to the top, strongly built with thick walls to conserve the cool air and keep out the hot.

TUG-OF-WAR ON HORSEBACK

THE Mexicans in Los Angeles, California, celebrated their centennial of Independence Day on the 16th of September with national sports, and the most picturesque of these was the tug-of-war on horseback shown in this photograph. The vaqueros were all in gala costume of velvet; scarlet or crimson or emerald green, with slashed trousers showing the silken lining and buttons and trimmings of silver. Thus arrayed and mounted on splendid broncos they lined up at the two ends of a long stout rope to which was attached a number of shorter ropes. The contestants took a half hitch about their saddle horns with these short lengths and at a signal backed their horses, or if they could do so, turned them so as to pull against the rope. Several horses were thrown while trying this manoeuver and one or two vaqueros were pulled from their mounts, saddles and all. Finally one side obtained the advantage and the opposing team was dragged clear across the field, leaving no room for dispute. This was treated as a glorious triumph for the winning party while the losers were much chagrined with their defeat.

ANOTHER OLD SILO.
Acorn form of place for keeping ensilage through from season to season.

THIS IS A PHOTOGRAPH OF THE DEVICE DESCRIBED ON THIS PAGE.

NEW MAIL CRANE

THE old time mail crane allowing a swiftly moving train to gather in the outgoing mail from way stations without stopping is to be filled by a new device, a product of the genius of W. P. Sebree, an inventor of Carrolton, Kentucky, which not only gives out the outgoing mails of one, two, or even three sacks to the mail car as it passes but also accepts the same number of pouches and holds them. The mail is received and delivered on coil steel springs which take up the shock. In fact so light is the impact of the mail sacks that a live pig was put in a bag and caught by the new mail catcher without the slightest injury to the porker, although the train was traveling at twenty-five miles an hour. The invention consists of a square steel frame to which is attached a slack steel chain net. The frame swings on hinges attached to sliding bars so that the device may be easily changed from one side of the car door to the other, according to the direction the train is traveling in at the time.

The outside lower corner of the frame is held by an iron rod, the other end of which travels on a bar attached to the car side and containing a set of spiral steel springs which relieve by the compression the shock of the device which catches the sacks, from one to six in number and capable of handling weight of 260 pounds or less at a rate of speed from eight to eighty miles an hour. A similar frame and net is located on the station platform and the sacks to be delivered are attached to the lower outside corner of the catching net, so that the exchange is made automatically.

HOUSE BUILT OF COAL.

Curious and artistic building, constructed of high grade bituminous, for the advertising effect at the Appalachian Exposition at Knoxville.

February '11

A ROOF GARDEN ON A PENITENTIARY.
Convict band at Bilibid Prison, Manila.

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HOLDING UP MAIL FRAUDS

By

BAILEY MILLARD

Postmaster General Hitchcock is authority for the statement that $100,000,000 has been taken from innocent but gullible people in the United States, in the past five years, by men who have made it their business to fleece the unwary. The following story tells the methods of swindlers who prey upon unsuspicious investors, using the mails for this purpose, and how Uncle Sam is crushing the crooks as fast as evidence is available against them.

AT a flat-topped desk in the middle of a large, plainly furnished room on the fourth floor of the big New York postoffice building sat a plain-looking man, smoking a plain-looking pipe. The man had a comfortable, easy-going air about him. He looked as if he had found this world a very pleasant planet, peopled by amiable folk who never dream of doing each other the least injury. And yet that man had seen more of carefully planned and deliberately carried out rascality than any other man in the country.

He is the chief inspector of the largest postoffice in the country, the man at whose word tons of fraudulent mail matter are "held up" every month. He is the man who ferrets out the cold-blooded schemes of colossal swindlers and lands many of them in grated cells. He and his assistants are saving the gullible people of this land of the free and home of the knave hundreds of millions of dollars every year by shutting down the floodgates of those circular mills that start up every day in New York, the head center of mining company frauds, patent-right swindlers, rubber plantation robberies, fake oil plants and many other get-rich-quick concerns in which the only ones who get rich are the folk to whom the money is sent.

And yet so modest is this pipe-smoking official that when I asked him for information to use as a basis for a magazine article he declined to speak a word on the subject unless I should promise not to print his name. And when I coaxed him to permit me the use of it he was as hard and obdurate as the big gold-brick that had been wrested from the hands of a swindler of down-east haymakers, and that was now doing innocent duty as a paper-weight.

His modesty extended itself to his statements concerning the workings of his office. When I showed him a newspaper clipping crediting that office with having "held up" a fake mining concern reported to have robbed people of thirty million dollars in three years the inspector smiled and said:

"Oh, it was nothing like that amount! You have to take these statements with a grain of salt. But please don't quote me as to facts and figures about anything."

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THE "STRAIGHT IN THE EYE" MAN.
W. J. Wintemute, accused by Lady Tankerville and other women of gigantic frauds.

I promised that I wouldn't, and I will keep the promise. Let me say that what I am going to write on the subject of big postal hold-ups and kindred affairs was plucked from the circumambient atmosphere or was gathered from anywhere save from the office of that quiet inspector who sits at his desk, smokes his pipe and gazes at the big gold brick.

When it is stated that hundreds of millions of dollars are saved to gullible people every year by the vigilance of New York's chief postoffice inspector and his men it is not meant that this money is rescued from the mails on its way to the central fraud office, and returned to the senders, though much money is so rescued and returned. What I mean is that the holding up of the mail of the schemer and the breaking up of his business prevents further loss by dupes and acts as a check to the putting forth of new plans by new plunderers.

Who are these dupes? Well, it seems by the lists of names and addresses seized at the fraud offices when an arrest is made that they are chiefly school ma'ams, widows, clergymen and clerks. The number of women all over the country swindled by mining-stock and patent-right schemers is something appalling. There are no actual statistics on the subject, but the number of gulls and dupes runs up into the millions. In the past five years nearly a hundred million dollars has been sent to New York by these persons and the money is still coming in at the rate of about fifty thousand dollars a day.

It is strange that women with their oft-credited "intuitive minds," the possession of that wonderful "sixth sense," are so easily swindled by glittering circulars and prospectuses. And yet even so cunning a financier as Hetty Green owns that in her varied career she has been duped many times and for large amounts—larger than she probably ever saved by living in a thirty-five dollar Hoboken flat. Mrs. Green acknowledges that she always went in with her eyes open, but no matter how widely open those eyes were at the moment she signed her check, they were still wider open when she saw the game of the swindler for what it really was.

If a woman who can scent a wildcat as far as can Hetty Green gets scratched occasionally by that animal, what earthly show is there for the average wife or widow of large or small means who is looking around for a gilt-edged investment?

And, remarkable as it may seem, those scratched or bitten the hardest are often the easiest victims. How is this for a scheme to catch men and women that have already lost money in mining stocks and that wouldn't invest again if stock in the famous Treadwell Gold Mine of Alaska was offered at the price of postage stamps? William J. Wintemute of 17 Battery Place, New York, sent out tons of circulars and made $1,300,000 in ten years' operations by offering to exchange stock in the Gold Run Mine of Arizona for worthless mining stock on payment of ten cents a share, neglecting, of course, to insert the word "other" before "worthless." Now it is safe to say that half the women in the country who have had money to invest in securities of any kind hold worthless mining stock, and the exchange of such

stock for the precious paper of the Gold Run Mining Company on payment of the trivial sum of ten cents a share seemed to many of them a good way of getting back some of their money, particularly as the Gold Run's dividends were "guaranteed." Wintemute's hypnotic circular made the swindled ones fairly run for their checkbooks. Look at the alluring literature.

STRAIGHT IN THE EYE.

I am looking you straight in the eye when I say to you, "Exchange your worthless mining stock for Gold Run. Don't cringe, or squirm, or dodge my glance; but look at me straight in the eye and tell me why you don't exchange your worthless stock for Gold Run at ten cents a share."

Wintemute hypnotized thousands of women, ministers, doctors and clerks by this circular, and his receipts were enormous up to the middle of last August when the postal authorities seized his literature and the stock of the Gold Run Company of whose affairs he had, by the way, made no accounting for years. Nobody ever buys mining stock by the single share. Most people take a hundred or more, so that Wintemute averaged over ten dollars from each victim. He swindled thousands of British women. What precipitated his downfall were the complaints of Lady Tankerville and Miss Henrietta Elout of Glendale, England, who lost $45,000 in a straight investment on Gold Run. In her eagerness to put her money into the swindler's hands Miss Elout sent him $2,500 too much. She wrote to him about her error, but received no reply. She wrote again. Wintemute was still mute. At last Miss Elout received a letter from the hypnotic fraud enclosing $2,500 worth of stock which he said he felt assured she would accept instead of the money in view of large dividends that were imminent. Miss Elout did not like this queer transaction, but she was passive for a while. But as the dividends remained "imminent" she and Lady Tankerville, who had also invested largely in Gold Run and was getting no run for her money, complained to the postal inspectors. That complaint wound up the profitable business of exchanging one worthless mining stock for another at a paltry premium, and soon Wintemute was looking a turnkey straight in the eye through prison bars made especially for the confinement of such frankly gazing gentlemen.

As for the swindlers who prey upon widows there is a large variety. Some of them play the same old game, while others successfully try the new gold brick. One plan that rarely fails where a woman undertakes to manage her own affairs is resorted to by men who look up the death lists in the newspapers, select a newly made widow of some means and write to her husband as if he were still alive. The letter, somewhat skeletonized, reads like this:

"My Dear Brown:

"This is to remind you that the last instalment on that Simpson Automatic Brake stock is now overdue. The payment, you remember, is $275. I am willing to take the stock off your hands and will send check for it by return mail if you so desire, but as you have paid in over $3,000 I suppose you will want to see it through.

"A dividend of ten per cent. is to be

EVEN MRS. HETTY GREEN ADMITS HAVING BEEN SWINDLED MANY TIMES BY UNSCRUPULOUS MEN.

declared on the first, and as you have found the investment to be such a paying one you will perhaps be willing to send a check for the $275 before the end of the week in order to get the benefit of accruing profits.

"Faithfully yours,

"R. M. Snyder."

Mrs. Brown never has heard of Mr. Snyder, but as he was evidently on confidential business terms with her late husband, she does not hesitate to send the check for $275 in order to get the dividend and further enjoy the accruing profits, which of course never accrue.

TURNED HER BANK BOOK OVER TO A CLEVER STOCK MANIPULATOR.
Mrs. Mary Nevins Bull, widow of the famous Dr. W. T. Bull, of New York.

Widows of millionaires, though surrounded by legal advisers, often bite at swindling stock schemes of all kinds, and they are also luminous marks for the Man with Something to Sell, whatsoever he may have to offer. Dealers in imitation art work, pictures, statuary and "antiques" of all kinds sometimes sell thousands of dollars worth of junk to wealthy women. Some of these women merely glance at the stuff that is brought to them and sign checks for large amounts for it before they are told by some expert that they have purchased cheap fakes.

Among ladies who have been deceived and despoiled by unscrupulous dealers of this class are Mrs. "Jack" Gardiner of Boston and Mrs. C. T. Yerkes of New York. Mrs. Russell Sage, a very worthy woman, of large charities and open purse, has lost many thousands of dollars by impositions of many kinds. Clever schemers, after reading of the openhandness of such women, lie awake nights plotting to get their money.

Not long ago a wealthy New York widow who sometimes consulted spirit mediums, was approached by a clever clairvoyant, a woman who was a keen reader of human nature, and who told her many things about herself which she thought were heart-in-heart secrets. The clairvoyant advised her strongly against "a certain investment you are about to make," and suggested a better one which was the purchase of a block of stock in a land scheme. At first the spirits would not divulge the name of the company.

"Ah, I have it!" she cried at last—"the South Texas Investment and Realty Company, office 976 —— Building, Broadway."

Within a week $30,000 of the credulous lady's money found itself in the hands of the South Texas Company, one of the rankest frauds doing business in New York.

Women who swindle women and swindle them mercilessly are found in all large cities. A postal inspector told me of a game that is now being worked by two ex-actresses against whom the government had positive proof of illegal operations on a large scale and was about to "close up," having already confiscated a large number of their circulars. By the time this is published the women will be arrested. This scheme was to offer five dollar shares in tax titles on large estates in the Bronx, and upper Manhattan, and they have already sold over $200,000 worth of these shares, some of them being in titles to portions of the great Audubon estate. Women have been among the largest buyers of these shares. The victims "investigate" the plan by asking their lawyers if there are such things as tax titles and if they are good investments. On learning that tax titles in general are all right, they buy an interest in a million dollars' worth of property by the purchase of $500 or a $1,000 worth of shares and wait until they can get full possession on a large

sum from the owner for the redemption of title. They will wait a long time.

"We have investigated the titles," said a government official to me, "and we have found that in nearly every case the taxes have been paid by the owner, so that nobody could possibly get any title to the property by such means as these women propose."

Brokerage schemes by which women swindle other women sometimes seem solid enough when viewed from a distance, but when you get near them they look as flimsy as stage scenery. Nothing could have been more clever than the plan of Frances M. McLean of 26 Broadway, New York. She sent tons of circulars to salaried women wherever she could get their addresses. She inspired faith because of the fact that 26 Broadway was the Standard Oil address and she was able to refer her dupes to five reliable business men in New York. Mrs. S. M. Agnew of Cleveland, Ohio, was induced to invest $5,000 in the gilt-edged securities offered for sale by Mrs. McLean, who declared in her circular that she had been "studying the street" for ten years, had confidential business dealings with big operators and could always get "pointers" on stocks that were going to rise in value. A Cincinnati woman, the circular said, had made $50,000 by her advice, and a Chicago woman had made $75,000.

Mrs. Agnew was a shrewd woman. Such a glittering circular couldn't fool her. Before she would let Mrs. McLean have a penny of her money she would find out all about her. So she cannily wrote to all of those five reliable business men to whom Mrs. McLean referred her, and of course she got satisfactory replies.

"I regard Mrs. McLean as the most trustworthy stock buyer in the brokerage business," wrote R. W. Siegel, of Siegel, Strauss & Havermeyer. "She has made money for me and is now handling over $80,000 which I have invested through her."

Other "big business men" of solidly-sounding firms sent similar testimonials to the responsibility of Mrs. McLean. So Mrs. Agnew cheerfully sent her $5,000. Mrs. McLean replied by return mail that she had invested it in Pennsylvania Railroad stock, which all of Mrs. Agnew's friends said was always a "good buy."

About three months afterward Mrs. McLean wrote to Mrs. Agnew that she was in a deal to buy twenty-five thousand shares of Chicago & Northwestern and wouldn't Mrs. Agnew send along another $5,000? Mrs. Agnew didn't send it. She wrote and wanted to know how her Pennsylvania investment was coming on. Dismayed she was and righteously indignant when her "broker" wrote back that she was very sorry, but that she had sold Mrs. Agnew's Pennsylvania and bought coppers with the proceeds. The coppers had turned out badly and Mrs. Agnew owed her broker $417.82.

Mrs. Agnew then did what she should have done in the first place—she wrote to a New York attorney and asked him to look up Mrs. McLean. The attorney

Has Been Swindled More Than Once.
Mrs. C. T. Yerkes, of Chicago and New York.

couldn't find Mrs. McLean, but he found the chief postal inspector who told him that he had put the lady out of business after holding up ten thousand circulars she had just stuffed into the mail boxes. All those reputable and responsible gentlemen to whom she had referred her many victims turned out to be a single little office clerk in "the broker's" employ—a man of many names and addresses, with but one purpose in life, which was to share in the said "broker's" receipts. Those receipts amounted in one year to over one hundred thousand dollars, not a cent of which went back to the woman's widely scattered dupes.

Sometimes the postal inspectors are powerless to prevent the operations of big get-rich-quick concerns though they are appealed to by hundreds of dupes. The difficulty is, in many cases to gather sufficient evidence upon which to base a prosecution. The government is quick to investigate but slow to prosecute where it sees that a good fight can be made by the person or company complained of by its victims. A case in point was that of Ernest M. Arnold, a broker who listed nearly eighty get-rich-quick companies and purchased 264,404 shares of stock, most of which he sold to women and clergymen in New England. School teachers and stenographers in Massachusetts and Connecticut took Arnold's stock to the extent of over half a million, but though they bought for years and kept on buying, few of them ever received dividends, and hundreds of them lost all of their savings.

When Arnold finally went into bankruptcy the list of his creditors was said to have been the largest ever filed in New England. He swore to assets of $473,286.59, but most of these were proved to be fictitious, and he really had only about $40,000 left to be divided among preferred creditors, while the poor school teachers who had been working for him so long received little or nothing.

Mrs. Russell Sage Has Had Her Good Nature Cruelly Imposed Upon by Tricksters and Sharpers.

The holding up of Arnold's mail and a criminal prosecution were contemplated by the authorities, but his plan of operation was similar to that of other brokers and he could not be put out of business until his get-rich-quick companies failed, as such concerns usually do.

On other occasions, when fraudulent intent is obvious, the postal inspectors are quick to act. They will destroy tons of mail matter if they are satisfied it is intended to defraud or if it is of a prurient nature. Often they do not wait for victims to complain, but seize the swindling bull by the horns as soon as he steps into the ring. Such was the case of Rumsey & Company, represented by a sleek little man named James T. Rumsey, who hired desk room in Exchange Place,

New York, and mailed seventy-five thousand circulars in one batch asking for subscriptions to an oil land enterprise, promising returns of four per cent. a month.

The circulars had not been dumped into the mail boxes more than an hour before one of them was in the hands of the chief postal inspector, who sent a clerk to see Mr. Rumsey. Mr. Rumsey was not in when he called. He wasn't in for ten days, and when finally cornered he sent word to the chief inspector that his business was strictly legitimate and that the government couldn't stop it.

Finally the inspector haled Mr. Rumsey into his office and began to catechize him as to how he could offer four per cent. a month, or forty-eight per cent. a year, on oil, where ten per cent. was considered a good dividend.

"Why," said Mr. Rumsey looking the inspector square in the eye, "I have organized a syndicate to control the market from Pennsylvania to California."

"You are going to buy out Mr. Rockefeller, are you?" said the inspector with a smile.

"I expect to in time," declared Mr. Rumsey.

"Well, let me tell you right now, your bluff don't work," said the inspector. "If you don't mind, we'll just take charge of your office and return the money sent in by your dupes."

Of course Mr. Rumsey did mind, but there was nothing else for it, as on investigation it was found he had no financial backing whatever. He had merely bought a long list of names of probable "suckers" from a Wall Street firm that sells them at ten dollars a thousand. Then he had printed his glowing prospectus and had sent copies of it to the uttermost corners of the map.

Strange as it may seem, the promise of four per cent. a month was gravely accepted by nearly a thousand of the women, clergymen and others to whom it was mailed. They sent in their money for stock with the printed application enclosed with the prospectus and were greatly surprised and pained to receive it back accompanied by the Rumsey circular across which appeared a big government stamp, "Fictitious." Rumsey escaped prosecution by the simple proc-

"Cheiro," the Palmist. A Smooth Man in Dealing with Wealthy Women.

ess of evading the authorities and taking a steamer for Europe.

Unless buyers of stock are actually victimized, criminal prosecutions are rarely begun against offenders. Even where large sums of money are taken from dupes through the mails the schemers sometimes escape prison. They are generally admitted to bail and a long period elapses before their cases are tried, generally for the reason that it is difficult to secure direct evidence against them. But the main object of the hold-up and arrest of the swindler is accomplished when he is compelled to discontinue his nefarious game and the victims are enlightened as to the nature of his scheme.

For this work of postal inspection is chiefly a campaign of education. Thousands of intending investors who send in tempting circulars to the New York, Chicago and other postoffices with letters of inquiry receive back the circulars

with that significant word "Fictitious" stamped upon them. The people all over the country are learning that to put their money into the hands of circular-sending concerns that promise big dividends on small investments is a mighty risky thing to do. Few really solid stock companies ever promise more than six per cent., and those that bait their hooks with offers of twenty to thirty per cent. are generally frauds.

Mrs. Mary Nevins Bull, widow of Dr. William J. Bull, the famous New York surgeon, recently brought an action against a promoter whom she accused of swindling her out of $35,000 by inducing her to invest in a magnesia-asbestos company which, according to the promoter, was netting $2,000 a day by purchasing raw material at $15 a ton, running it through the mill and selling it at $250 a ton.

"I let him take my bank book," testified Mrs. Bull in court, "that he might look at it and tell me how much he thought I could afford to invest in the scheme. I had $41,000 in the bank, and he told me I could spare $20,000. I asked him to write the check and I would sign it. I had previously let him have $15,000."

A Victim of Unscrupulous Art Dealers.
Mrs. "Jack" Gardiner, of Boston.

Magnesia-asbestos, so Mrs. Bull was informed, was made by a secret chemical process. It was the most wonderful fireproof building material in the world. The longer it stood, the harder it became. In that respect it was like a bad investment, only the promoter didn't tell her so, for the magnesia-asbestos deal was all to the good in fifty-two different ways. It was a chance for Mrs. Bull to enrich herself beyond the dreams of avarice, but somehow it failed to come up to the dream or anywhere near it; and so Mrs. Bull wanted her money back, and was greatly surprised that she didn't get it, for the stock which could always be turned into cash on a moment's notice, didn't seem to be convertible even on a year's notice.

The postoffice inspectors have done good work in suppressing many small schemers by which thousands of women have been swindled. One of these is the "Be-a-song-writer" game, advertised all over the country a few years ago and still running, though in a limited way. The game is to a get a verse-writing woman—men rarely bite at the "ad"—to send in her "poem" and fifty or a hundred dollars to pay for setting it to music. After the publication of the song she will receive a large royalty. The woman sends her money, gets a few dozen copies of the song, which are all there is to the "publication," and waits for the royalties which never come.

The "Work-at-Home" game is one of the wickedest of all the catch-penny frauds of circular-senders. "Any bright woman can make $2 to $3 a day by doing the light work we require," runs the advertisement. "Send for particulars." The victim writes for the particulars and receives a type-written circular stating that the work is the finishing of corset covers or the embroidering of slipper patterns. Samples and material will be sent on application. When the work is finished and returned it will be paid for at the rate of 50 cents the piece, "if done like sample."

"You can easily make a dozen or more of these articles in a week," says the circular. To cover the cost of the goods

a deposit of one dollar is required. The poor woman sends the dollar and gets a finished and an unfinished corset cover. She works hard, completes the cover in a day or two and sends it in, accompanied by the sample. A part of the work is the sewing-on of a couple of pieces of watered ribbon. When she hears from the swindlers it is to the effect that this ribbon is not sewed on right, or that a stitch has been skipped somewhere in the cloth. There is always something wrong, and so the expectant worker is never paid, nor does she receive her money back. The article she has worked is sent to some other victim as a sample, and so the "company" keeps a chain of women at work for it, making up material to help dupe other women. The swindlers net about seventy-five cents from each dupe. It is a wicked game, and the postal authorities have done their best to stop it. They have held up stacks of circulars from time to time, but the fake bobs up serenely in new places and under new guises, and is still going on.

JOHN A. QUALLEY AND HARVEY W. CORBETT AS THEY APPEARED ON TRIAL FOR SWINDLING A WOMAN OUT OF MANY THOUSANDS.

During the past year a more vigorous campaign has been prosecuted against the get-rich-quick concerns than ever before. The biggest fish landed by the government were the Burr Brothers, with offices in New York, Chicago, San Francisco and Los Angeles. These men, whose central place of business was in the Flat Iron Building, New York, are said to have cleared $15,000,000 on bogus stock transactions of all sorts. They were arrested November 21, 1910, and were sent to the Tombs. Their "sucker" lists, one of them containing twenty thousand names of clergymen, school teachers and widows, were all seized by the inspectors and their business which radiated all over the world, has been closed up.

After the arrest of the Burr Brothers the following statement was made by Postmaster General Hitchcock:

"With the work accomplished today, seventy-eight cases have been brought to a head during the year. The swindling operations of these seventy-eight concerns have filched from the American people during the past five years over $5,000,000."

Burr Brothers began their financial operations in a Harlem flat after they quit selling collars and shirts in Leavenworth, Kansas. They dealt chiefly in California oil and mining stocks.

Strong cases have been prepared against them and they are likely to be sent to prison. Still plenty of other fraudulent games are constantly going on and, like the perennial gold brick, continue to lure country money into the hands of city swindlers.

But the postal campaign of education is doing good in many ways. For one thing, the Boards of Education of many towns will not give out the names and addresses of school teachers where it is suspected that they are to be enrolled on the mailing lists of the Man with Something to Sell. In this way many women are saved from the clutches of swindlers large and little.

Of course many men are swindled by mail-order schemes, as well as women. I have taken up the woman side of the matter because just now women are being victimized more than men, and it is time that this phase of mail-order swindling was presented to the public.

It is a heartless business this swindling of women. It requires a person of reptilian blood and reptilian smoothness. But in nearly every case the man playing the game overreaches himself, particularly if he uses the mails to carry out his felonious little plans. The postal inspectors say that four out of every five of the big tricksters come to grief, and

I will warrant you that the fifth man does not escape. For if it is true as I believe, that the thief steals from himself, then the swindler always swindles himself. Right and justice are not empty words. The everlasting "Yea" stands behind them, and just so there stands behind injustice and wrong the everlasting "Nay." If four out of five of the big swindlers come at last to the prison gate, that fifth man, still unjailed, will be made ultimately to suffer in some way. Yes, verily, the swindler swindles himself.

Border Ballad

March, march, Ettrick and Teviotdale,
Why the deil dinna ye march forward in order?
March, march, Eskdale and Liddesdale
All the Blue Bonnets are bound for the border.
Many a banner spread
Flutters above your head.
Many a crest that is famous in story.
Mount and make ready then,
Sons of the mountain glen,
Fight for the Queen and our old Scottish glory.

Come from the hills where your hirsels are grazing,
Come from the glen of the buck and the roe;
Come to the crag where the beacon is blazing,
Come with the buckler, the lance and the bow.
Trumpets are sounding,
War steeds are bounding;
Stand to your arms, then, and march in good order,
England shall many a day
Tell of the bloody fray,
When the Blue Bonnets came over the Border.

—Scott.

CLEANING UP THE PHILIPPINES

By

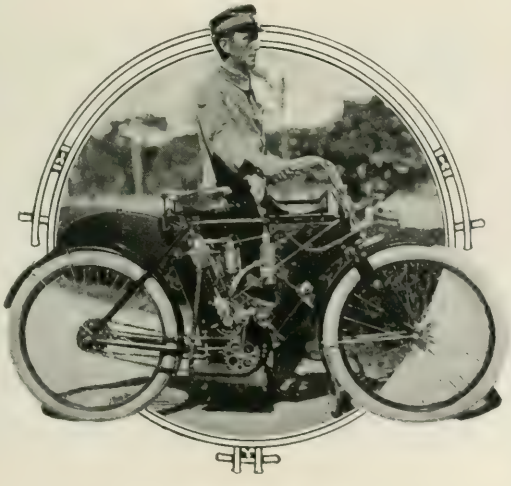
RENÈ BACHE

ALL the world stands amazed at the feat accomplished by Uncle Sam in the cleaning up of the Canal Zone—a region which, formerly one of the most pestiferous on earth, is now as healthful as any part of the United States. But, in the meantime, very little attention has been attracted to a similar work, involving difficulties vastly greater, which is being successfully carried out in the Philippine Islands.

This task, the chief feature of which is the cleansing of Manila, is as yet far from completion. Enough has already been done, however, to effect a great sanitary transformation in the archipelago, and to insure the prospect that in the near future the ancient capital of the islands will obtain recognition as the model Oriental city. Under the Spanish régime it was, like most other centers of population in the far East, pest-ridden and filthy to the point of the indescribable. Governed by Americans, it is becoming clean, healthful, and in all respects modern.

Manila is built on a tidal flat, intersected by the mouths of the Pasig River and by numerous canals. The highest parts of the city are less than ten feet above mean high tide. Such topographical conditions would render sanitation difficult under any circumstances, but, taking into view the tropical climate and the peculiarities of the people, whose ideas of personal hygiene are primitive, to say the least, the obstacles in the way of really effective and permanent "cleaning up" may be to some extent realized.

Much of the trouble comes from the long-established custom of permitting houses to be huddled together promiscuously. In some quarters, when the bureau of health began its work, it was found that over very considerable areas there were no streets or alleys. This method had resulted in the growth of horribly filthy and congested inclosures, even in the better parts of the city, while in the poorer districts the typical arrangement was a cluster of dwellings that could be entered only on foot by a narrow path, not wide enough for the passage of even a garbage cart.



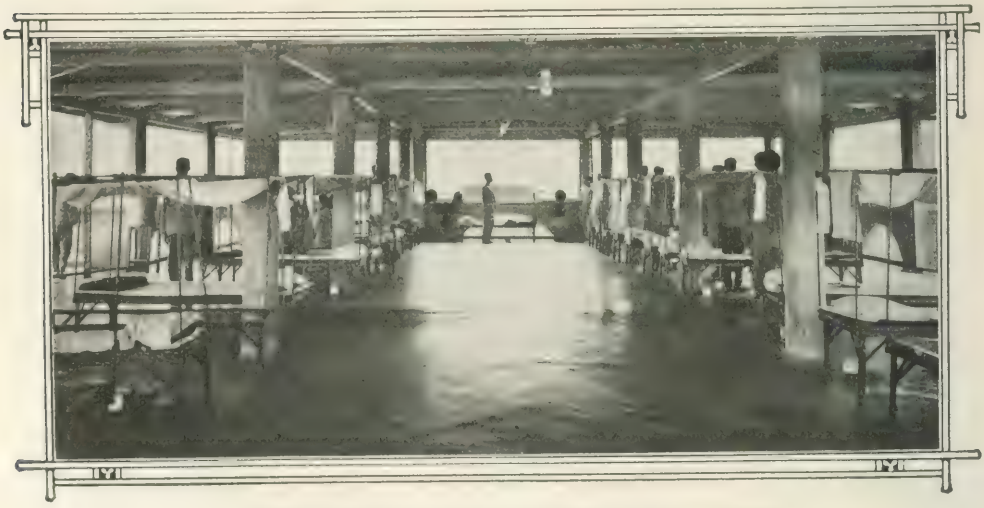
A Sanitary Inspector, Manila.

Imagine a town of 250,000 people built to a great extent on such a plan, with domestic and other wastes lying in pools under and between the houses; extensive districts covered with assemblages of miserable shacks, without any proper kitchen facilities, and wholly devoid of plumbing or sewer conveniences; an overcrowding in such areas greater than

A LEADING INDUSTRY IN THE PHILIPPINES.
Drying cocoa nuts from which later on oil will be extracted.

that of the famous "lung" blocks of New York and Chicago—picture these conditions, with inhabitants most of whom are satisfied to get rid of refuse of whatever kind by throwing it out of the window, and the difficulty of the problem of "cleaning up," especially when epidemic diseases are to be fought, is plainly enormous.

Strange though it may seem, the efforts of the Bureau of Health to correct this state of affairs were not encouraged at first by the better class of people in Manila. These people were not accustomed to visit the poorer quarters of the town, and they kept out of the filthy and congested enclosures above described. Matters of the kind, therefore,



A TUBERCULOSIS WARD IN THE NEW BILIBID PRISON.

BILIBID PRISON BAND SOUNDING OFF AT RETREAT.

did not seem to concern them very much, and their notion was that the Bureau was simply persecuting an inoffensive class of poverty-stricken unfortunates. What they needed, to alter their views, was the lesson of a severe epidemic of cholera, at a time when serious losses to business would result. The epidemic came; a campaign was successfully waged against it by the Bureau, and, public opinion being at last awakened, the well-to-do and influential inhabitants of the city yielded a reluctant approval to American methods.

Since that time a new sanitary sewer system has placed Manila in the front rank of Oriental cities in the matter of sewage disposal. A new gravity plant supplies "mountain water" from an uninhabited watershed, practically insuring the town against a serious outbreak of cholera or other grave intestinal diseases. New systems of garbage-collection and street-cleaning have already accomplished wonders. All wells —their water being in nearly every case polluted —are being filled in. The water used in the past by the people of Manila was for the most part unfit for drinking. Many artesian wells have been bored under the direction of the Bureau of Health.

Meanwhile, thousands of the most insanitary hovels have been condemned and removed, other building sites being provided elsewhere for the occupants, at a cheap rental. The Bureau realized that it was useless to insist upon destroying the houses of the inhabitants of the unhealthful districts unless other places were provided for them to settle. If such provision were not made for them, they would merely be driven from one

LEPER COLONY AT CULION.
The white-roofed building is the hospital.

TYPICAL SHACKS ON
These have been con-

insanitary site to another, and the charge of persecution would be hard to refute.

Dr. Victor G. Heiser—a surgeon in our own Public Health Service—occupies the important post of Director of Health in the Philippines. He says that the "sanitary block" is the foundation on which all future work in the cleaning up of Manila will be based—such a block being located on easily drained land, subdivided into streets, alleys, and lots, and provided with a public bath, a public laundry, and a public water-hydrant.

When the tide rises in and about the great flat on which Manila is built, the water runs up through the canals that cut up the town, and incidentally overflows considerable areas of what are called "lowlands." This, of necessity, gives rise to the breeding of vast numbers of mosquitoes, which are the plague of the Philippines. Such measures for the destruction of the insects, or for the prevention of their breeding, as have proved effective elsewhere are useless here—at all events, for purposes of merely temporary relief. What will have to be done sooner or later, in order to do away with the mischief, is to dredge and wall the canals, and fill in the lowlands, elevating the latter sufficiently to render them available for residential uses. Incidentally, the superfluous canals will be filled in, and the desirable ones straightened. This will cost about $2,500,000, but the gain in the value of real estate will alone repay the investment, not to mention the advantages of improved sanitation and freedom from the mosquito annoyance.

Under the direction of the Bureau of Health, the markets of Manila have undergone a veritable transformation. New buildings have been provided for the purpose, but the most important departure has been that by which all venders are brought under control and observation. No longer are they allowed, as of old, to fetch produce into the city from cholera-infected towns; or yet to

A CANAL IN MANILA.
demned and removed.

keep part of their wares in filthy inclosed places. They are required to expose all food supplies on tables, and not on the floor. Receptacles are provided for refuse, and nothing is permitted to be hidden. All premises and utensils are kept clean, and there is plenty of light. Animals for slaughter are invariably subjected to antemortem and post-portem examination by experts of the Bureau of Agriculture.

Insanitary dairies have been suppressed, and a new system of milk delivery has been introduced. Canned milk is being imported from the United States in steadily increasing quantities, the fresh article being not always easy to get, because so many cows have been destroyed by "rinderpest." The Society for the Protection of Infants, organized by charitable ladies of Manila, and operating under the direction of the Bureau of Health, distributes a limited amount of sterilized and modified milk—a good work which might be expanded to great advantage in Manila, where fifty-two per cent. of all the babies born do not live to reach the age of one year!

This, it may be remarked incidentally, is the reason why the population of Manila does not increase. Too many babies perish from natural, though often preventable, causes. The mortality among young children in the cities of the United States during the hot months of each year is frightful; but it should be remembered that the hot months are all the year round in the Philippines.

Nevertheless, Dr. Heiser says that those who are willing to observe a few simple rules can maintain good health in the tropics with more certainty than is possible in a temperate climate. Such diseases as pneumonia, diphtheria, scarlet fever, and rheumatism, which are the foes to be dreaded in temperate latitudes, are not easily preventable. On the other hand, the typical diseases of the tropics, such as dysentery, hookworm, and ma-

laria, are easy to prevent. The rules for the preservation of health in the Philippines, as laid down by Dr. Heiser, are: (1) Be vaccinated; (2) Never drink water that has not been boiled or distilled; (3) Avoid patent

TODAY MILK IS DELIVERED IN BOTTLES.

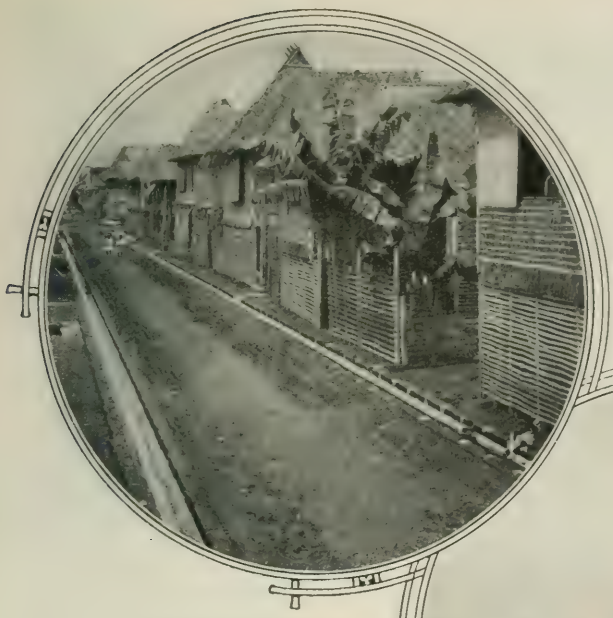
PICTURESQUE, BUT INSANITARY.
Old style milk venders.

medicines; (4) Eat fruit that grows on trees, but not fruit nor vegetables that grow close to the ground, unless cooked; (5) Inasmuch as the disease-carrying mosquitoes fly at night, always sleep under a good net.

Amœbic dysentery is the white man's worst enemy in the Philippines, as elsewhere in the tropics. More permanent disability is caused, and more persons are compelled to give up their residence in the archipelago, by this malady than by all others combined. It has been the most formidable opponent of the American occupation of the islands thus far encountered. Yet it belongs to the class of preventable diseases. It is almost unknown (says Dr. Heiser) among people who wash their hands before eating, who drink only water that has been freshly boiled or distilled, and who do not eat in a raw state such low-growing garden vegetables as tomatoes, celery, onions, cabbage, and lettuce.

Concerning "beriberi" enough has been learned within the last few years to make the stamping out of this tropical disease a comparatively simple matter anywhere. It seems to be a species of rice poisoning. At the Kuola Lumpur Lunatic Asylum, in the Straits Settlements, the patients, numbering 246, were divided into two equal groups, half of them being fed on ordinary rice, while the rice eaten by the other half was heated in water before being husked. Among those who ate rice in the ordinary way, forty-three cases of beriberi developed, while among the others there was not one case of the complaint.

The cholera question in the Philippines presents a problem much the same as typhoid in Europe and America. Dr. Heiser says that the experience of his Bureau has demonstrated again and again that the disease can be controlled, and that anybody is safe with a few simple precautions. Every now and then it breaks out in Manila, but is promptly suppressed, with the loss of only a few lives.



A Suburban Street in Manila, Today.

The Sort of Streets and Buildings You See Where Things Haven't Been Cleaned Up.

Manila, formerly infected with bubonic plague much of the time, is now entirely free—permanently, it is believed—from that dreaded malady. In dealing with this problem attention has been paid almost exclusively to the rat, which is the carrier of the disease. New rat-proof wharves, of concrete, have been built along the water-front of the city, and every vessel that arrives from a plague-stricken port is fumigated, to kill such rats as may be on board. In the meantime, dwellings and other buildings over extensive areas have been made rat-proof.

During the six years from 1900 to 1905 Manila paid about $400,000 for the trapping and poisoning of rats, with the result that at the end of this period they remained as plentiful as before. Experience of the Japanese in Tokio and Osaka was similar, and led to the conclusion that measures of the sort were useless. A given city could contain only a certain number of rats anyhow, and, multiplying always up to the limit of available food supply, they would eat each other as soon as this line was passed. So extraordinary was their rate of breeding that, apparently, they could keep up with any imaginable means of destruction.

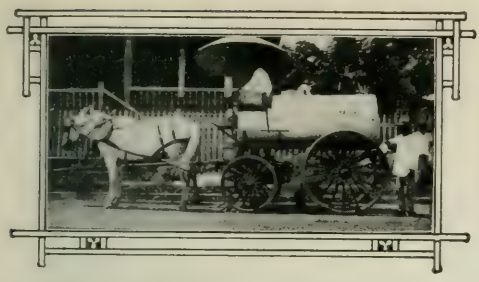
This was certainly a discouraging outlook. But the Bureau of Health undertook to tackle the problem by a new method. A list of places at which plague-infected rats were found was made, and each was marked on a map of the city as a center of infection. From such a center five radiating lines were drawn, like spokes of a wheel, and rats were caught along these lines and examined. Specimens suffering from plague were seldom found more than a few blocks away. The furthermost points at which such infected animals were captured were then connected on the map by dotted lines, and the space thus inclosed was considered an infected district.

So much having been accomplished, the entire rat-catching force (which formerly had been scattered all over the town) was concentrated along the borders of this district, and moved steadily toward the center, catching all the rats as it proceeded. All buildings, sewers, etc., were made thoroughly rat-proof along the line of march. In this way

DISINFECTING DISINTERRED BONES OF CHINESE BEFORE SHIPMENT TO CHINA.
THEIR FINAL RESTING PLACE.

one section after another was treated, and at intervals of a week for one year afterwards rats were caught for examination, in every district which had been infected. As a result, bubonic plague among human beings disappeared from Manila in 1906. In 1907 it ceased to be found among rats, and it has not since

INSIDE THE LEPER HOSPITAL.
Four sisters of charity are in charge of this institution.



PURE WATER HELPS TO DRIVE OUT FEVER.
Wagon of Distilled Water Bureau of Supply. Division of Cold Storage.

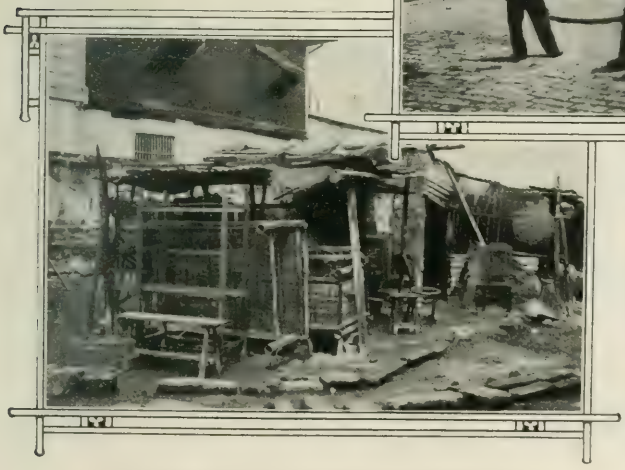
reappeared—a direct proof that rats spread the malady.

One of the most serious of the problems involved in the cleaning up of the Philippines has been that of leprosy, which is very prevalent in the islands. The policy adopted by the Bureau of Health in fighting this disease has had for its most important feature the collecting of lepers from all parts of the archipelago, with a view to their segregation and treatment. Careful search has been made everywhere for the unfortunates, and even suspected persons have been brought in, many of them being fetched by government steamers from distant points. At the close of the last fiscal year, the estimated number of lepers in the islands was 2,273.

Patiently, yet with firmness and persistence, the agents of the Bureau have sought out incipient cases of leprosy, and have transferred them to the leper colony at Culion—the carrying out of this policy offering, as it is believed, the only prospect of ultimately eradicating this most loathsome disease from the Philippines. The work of isolating the unfortunates began in 1906, and up to the close of the fiscal year ended June 30, 1909, there were 3,990 of them collected. No trouble in the matter has been encountered, the lepers and their friends acquiescing cheerfully, as a rule, to the measures taken.

At Culion there are today about 1,900 sufferers. Most of the advanced cases that reached the colony in a hopeless condition have passed away, and many of the survivors are experiencing marked improvement from treatment by the X-ray, and especially from the use of crude chaulmogra oil. This treatment is supplemented with hot baths and liberal doses of strychnine. Complete recoveries are not infrequent. Meanwhile, the lepers exhibit a cheerful activity in the cultivation of the gardens, and in many instances they have eagerly accepted offers made by the government to furnish farm animals and implements.

BURNING A CHOLERA INFECTED DISTRICT IN MANILA.



THE MANILA BOARD OF HEALTH IS ATTEMPTING TO HAVE "HOUSES" OF THIS CLASS REMOVED.

No chapter in the history of American sanitation in the

YARD TUBERCULOSIS HOSPITAL AT BILIBID PRISON.

Philippines is more satisfactory than that which concerns the famous Bilibid Prison. When our people took charge of this establishment, they found that it consisted of a large number of stone buildings which had been constructed in an age when modern principles of sanitation were not understood. The death rate among the prisoners was 261 per thousand—more than one-fourth of the entire number of those confined in the prison died every year. Today the death rate is nineteen per thousand.

The Bureau of Health started in by replacing the bamboo beds, which harbored swarms of vermin and defied cleaning, with steel bunks. It installed a modern sewer system, furnished sterilized drinking water (allowing no other water to be drunk), and, while carrying out other matter-of-course sanitary measures, made the prisoners contented by providing them with employment. Many eye troubles among them were prevented by painting the buildings slate color which, formerly red, and later white, had reflected a glare of sunlight.

To relieve overcrowded Bilibid, and to give a chance to prisoners who showed a desire to reform, the Iwahig Penal Colony was established in 1904. The site chosen was that occupied by a similar colony in Spanish times, and abandoned on account of the excessive death rate from malaria, dysentery, and beriberi.

As yet, efforts to clean up the Philippines have been devoted chiefly to the city of Manila. To such extent as is practicable, they are being extended to other towns. The jails in such towns, for example, are modeled as far as possible after the new Bilibid. What seems to be needed more than anything else in the provinces is medical skill. Physicians are reluctant to leave the large centers of population and locate in the more remote districts. In many sections there are no doctors, and many people die for lack of the most ordinary attention.

MACHINE PICKS COTTON AT LAST

By

CARL CROW

IN 1820 a Louisiana cotton planter whose name has been lost to fame took the first step toward solving the labor problem involved in picking the South's big crop of cotton. This planter had visited a show in New Orleans and there saw a monkey which displayed remarkable intelligence, searching the pockets of strangers for candy, nuts and tobacco. The planter thought about this a great deal. He read up on monkeys and eagerly visited every show which promised to exhibit any of these interesting animals. He was a man of initiative and originality and it didn't take him very long to come to the conclusion that he could use monkeys to advantage in his business of cotton growing.

He sent to Brazil for a large consignment of the brightest monkeys on the market. After many delays they arrived and were given comfortable quarters on the Louisiana plantation. The little pickaninnies and the planter's children had lots of fun with them while they were caged up waiting for the cotton picking season. After the bolls began to open the planter removed the monkeys to the cotton field to begin their primary education as cotton pickers. As soon as they were liberated the monkeys heard the call of the wild and ran with great rapidity to the neighboring magnolia

THE MACHINE PICKS AS WELL IN A THIN CROP AS WHERE THE YIELD IS HEAVY.

trees. As there were no local monkey hunters the planter was compelled to abandon his experiment. It was said that during the short time that the monkeys survived the Louisiana climate nothing was so aggravating to the planter as their chattering in the trees.

For almost a hundred years planters and others have been trying to solve the problem of cotton picking by the invention of a machine. This problem began to grow serious soon after the invention of the cotton gin, which was achieved in 1794. Before that the work of separating the lint from the seed was so much harder than the picking that no one thought of the latter as being hard labor. By diligent work one could separate a pound of lint cotton from the seed in a day. One man would have to work more than a year to produce a bale. In 1790 the United States produced 3,000 bales of cotton, which sold at twenty-six cents a pound. Nine years later, with the cotton gin two years old, the production amounted to 41,600 bales, which sold at forty-four cents a pound. After that the production began going up by leaps and bounds. In 1810 it was 177,000 bales; in 1830 it was 689,880 bales, and when Fort Sumpter was fired upon the yield was 4,668,900 bales. After the civil war the increase in production again began increasing, until it is now more than ten million bales annually. But the production has not kept pace with the increase in demand, caused by the spread of civilization, which popularizes the custom of wearing shirts.

The one factor which has retarded the growth of cotton has been the fact that all the picking must be done by hand and the cotton pickers have not increased as fast as the demand for cotton. The problem of harvesting corn and wheat was solved before the Civil War. Hence the production of cotton in America has increased in fifty years only 175 per cent, while corn has increased 260 per cent, and wheat 188 per cent in the same time.

During the century which embraces the most important period of the cotton industry in America many inventors have sought to perfect a cotton harvester. More than four hundred inventors have felt themselves so near to the solution of the problem that they have secured patents from the United States patent office.

This Machine May Cause the Building Up of Big Estates in the South.
With it big fields can be cultivated with economy.

Many of these machines have been taken to the cotton fields for practical tests. Usually the machines wobbled over a few rows of cotton, picked a few locks, tore off the flowers and unopened bolls and left a trail of lint on the ground. The trials have been so many and the failures so unanimous that cotton planters long ago lost faith in the machines and refuse to allow them in the field.

Recently one of these cotton harvester inventors visited the farm of John M. Rhoads near Vernon, Texas, with a request to try his cotton picker on Mr. Rhoads' crop. Mr. Rhoads had previous knowledge of cotton pick-

ers and believed, like most other planters, that a negro is the only successful cotton picker extant. He was so skeptical of the thing that he refused to allow the machine on his field unless the inventor would agree to these conditions: first, that he pick the entire crop of one hundred acres; second, that if the machine failed to get the cotton clean from the stalk he should put some hand pickers in the field, at his expense, to complete the job; third, that he was to guarantee the grade and sample to be as good as the hand picked cotton.

The success of this machine, invented by Angus Campbell, of Pittsburg, and known as the Price-Campbell Cotton Picking Machine, is best told by Mr. Rhoads himself. In a letter Mr. Rhoads says:—"Mr. Campbell began actual operation in the field, and to the surprise of a large crowd present, the machine moved down the row of cotton, picking at least ninety per cent. of the cotton on the row. The field in which the machine was operated was 1,100 yards long, with rows forty inches apart. The last two weeks the machine was here I operated it myself, so I will refer briefly to that period of operation. I have already stated that the rows in this field were 1,100 yards long, and during this two weeks I averaged one round every thirty-seven minutes. I found the machine to be very easy to handle, experiencing only such troubles that are common with a gasoline engine, which I overcame very readily. I also experienced some trouble with the machine such as the trained operators had during their period of operation, as locking of fingers, clogging of the belts, and other minor troubles that will occur in the operation of any machinery, and I wish to state just here that I did not only repair the troubled parts, but adjusted them so they did not occur again. During the two weeks of cotton picking with the machine I picked 19,200 pounds of seed cotton, my best day's run being 6,400 pounds. During this time we had one rain, which delayed us twenty-four hours, and also some very cold mornings that made it too disagreeable to start early. I also noted that the machine would handle the rank cotton with just as much ease and pick it just as clean as it would smaller cotton, and the operator did not have to make any adjustment in passing from low to tall cotton.

"In my opinion Mr. Campbell has invented a machine that will mean as much to the cotton producer as the harvester has been to the grain producer. It will mean that one man can go into the field and pick as much cotton in one day as twenty or thirty men can pick by hand in one day, and the total operating expenses of the machine in one day, in my opinion, based on my actual experiences, will not exceed ten dollars a day, and the cost of picking the same amount of cotton by hand, figuring on one-half bale to the acre, would be not less than forty-eight dollars. I believe it would not take a Solomon to see that this difference would mean a net profit of thirty-eight dollars

All Ready for the Cotton Picker.

THE HAND PICKERS ARE LAZY AND CARELESS.

on one day's operation, to say nothing of the trouble that the producer is compelled to go to to secure these hand pickers and to provide a place for them to live, and many other annoyances that are familiar to the man with a large cotton acreage."

During the cotton picking season of 1910 the Price-Campbell Machine was in almost continual operation in Texas, moving from one farm to another, much as the self binders or the threshing machines move in the Northern states. During the Texas State Fair, which is held in Dallas during each October, the machine gave daily demonstrations which were visited by thousands of skeptical farmers, many of them suffering from "misery in the back" because of many seasons of cotton picking by hand. A more skeptical, doubting jury was never before empaneled than this one, yet their verdict was unanimous in favor of the machine. Farmers from a hundred cotton planting neighborhoods visited the machine every day and went back home to tell their neighbors that at last the impossible had been accomplished with the invention of a machine which would pick cotton.

A WHITE OVERSEER CAN GET A REASONABLE AMOUNT OF WORK OUT OF THE FIELD HANDS.

The machine itself is built on a chassis of about the dimensions of a sixty horse power automobile. The wheels are steel traction and the axles are high enough to pass over the cotton stalks without breaking them. In the places where the dashboard of an automobile would be are the interlocking steel fingers which pluck the cotton from the opened bolls and a conveyor which carries the locks to two bins or sacks suspended from the rear of the machine. As fast as filled these sacks are detached and replaced. In front sits the one operator with a steering wheel and throttle in easy access. The engine is mounted just to the rear of the driver and is connected by means of a chain drive.

Many obstacles are found to the successful operation of a cotton picking machine. In the first place cotton does not ripen all at once, as is the case with wheat and corn and other crops. In July the bolls which are nearest the ground and therefore the farthest advanced may be ready for the pickers. On top of the same plant will be many flowers and green bolls. It is important that the picker take the locks from the ripened bolls without harming the flowers, the green bolls or the plant itself. Again the cotton plant, though sown in parallel rows, like corn, has a great lateral growth and ripened bolls may be hidden by the more rapid growth of branches of the plant above. The machine must not only pick all that is in sight, but it must do more; its steel fingers must creep beneath the branches and pick out that which is hidden. This the Price-Campbell Machine does. Just how its flexible steel fingers acquire this almost human touch I do not understand, though I have seen. I believe that if Angus Campbell had invented the cotton picker two hundred years ago he would have been hanged as a disciple of the devil and his machine burned in front of the nearest cathedral.

As I understand it, the Price-Campbell Cotton Picker does not embody any strikingly novel features. Indeed every mechanical discovery had been utilized by former inventors. Different ones sought to solve the problem by using magnetism, electricity and pneumatics. One of the latter class of inventors preceded the vacuum cleaner by patenting a machine designed on the same principle. The contraption provided two seats in the rear for boys who aimed the point of the business end of the suction pipes at the opened bolls, securing their swift transportation to the wheezing interior of the machine. The machine was a success, but so much depended upon the agility of the lads who handled the suction pipes that it never proved any faster than the ordinary negro picker. The Price-Campbell Machine seems to be a success because of the fact that the inventor has worked carefully over every detail of the construction for eleven years. Of course the machine is not perfect, but tests have proven it to be far superior to the old hand picking method. Not long ago two bales of cotton were picked from the same Texas field, one by negroes, the other by the machine. The bales were ginned separately and then sent to the Wamsutta Mills at New Bedford, Mass., for a thorough test. Accurate account was kept of the waste in all the processes at the mill and it was found that the percentage was in favor of the machine picked cotton, its percentage being .0792, while the hand picked bale showed a loss of .0930 per cent. Further tests showed that the breaking strength of the machine picked cotton is greater. The waste in the cotton field has been mentioned as five to ten per cent., which is usually no larger than when the average shiftless negro is employed to do the work. Being a traction machine, the picker cannot operate on soft ground, but rains will retard hand picking as well. Neither can it operate on hilly country for the same reason that early automobiles could not climb hills. Doubtless much of the heavy weight which its thirty horse power engine now carries will later be eliminated, just as the weights of the other machines have grown gradually less. You could scarcely lift the first typewriter from the floor, but you can buy a good one now with a weight of less than six pounds. The gulleys which now would impede the passage of the machine through the average cotton patch may be filled up or replaced with tiling, just as has been done with wheat fields. There are not enough hills in the cotton producing country to constitute

HARVESTED BY THE SAME SORT OF COTTON PICKERS THAT DID THE WORK BEFORE THE WAR.

any serious obstacle to the general use of the machine.

When Campbell started in to invent a cotton picker he didn't stop with that one task accomplished. While studying the growth of the cotton plant, with a view to inventing a picker he saw that much of the other work done in connection with the crop could be performed with a machine. To make a machine pick cotton was the most difficult, so after he completed it to its present stage of perfection he made it a handy man of all work around the farm. It will break up the ground with a disc attachment; furrow it with a cultivator attachment, then plant it, chop it out after the seeds have come up, pick it when it matures, chop up the stalks when the crop has been picked, and then when the season is over it can be put in the barn and with a belt around its fly wheel, its thirty horse power can be used to run anything from a power churn to a cotton gin.

In many ways the invention of a cotton picker is of more economic value than the invention of a wheat harvester. Each year more than 30,000,000 acres are planted in cotton. An army of 10,000 men with modern agricultural implements could harvest this area of wheat in six weeks. To pick that number of acres of cotton means a much more difficult task. It would require the labor of 10,000 men three years. The serious part of the matter is that this work is not done by men. It is done by the women and children of the South. In the South Atlantic and South Central states 827,000 boys and girls between the ages of ten and fifteen work in the fields. Of this number more than 200,000 are girls. Add to this the women who are absent from the cotton patch only when motherhood compels them to remain at home and we have a million slaving for cotton—a million on whom the hope of the coming generation rests. Is it any wonder that a half million in Alabama cannot read or write? Is it any wonder that the average school term in Arkansas is less than three months?

When the wheat harvester was invented many farm hands who saw that the machine would remove their names from the farmers' pay rolls organized little parties and burned every machine they could lay their hands on. No such antagonism may be expected toward the cotton picker. Despite the fact that cotton demands more hard, cruel labor than any other crop, it does not support a large class of laborers. When the cotton picking season begins the planter's wife and children go out into the field before daybreak. With breakfast often as early as 4 o'clock, they are in the fields when the eastern sky begins to turn pink and there they remain until it is so dark that it is no longer possible to tell the open bolls from the green ones.

There is no chance to shirk. At one corner of the field is the scales. Each picker, hobbling along on bruised knees or bending over at a back-breaking angle, drops locks into a long sack which he drags after him with its increasing weight. When full it is carried to the scales and weighed. Each picker's work shows for itself. Of course this home

guard is suplemented by negro labor. During every cotton season cities as large as Fort Worth or Dallas are practically deserted by negro bootblacks and washwomen. All the floating and vagrant labor of the South is called upon during the picking season. But the planter does not depend on this. The young couple plant only the few acres that the two can care for. As the family increases, so does the cotton patch, in just the proportion that the young hands are able to aid in its care. To remain childless is to remain poor.

There is another effect the invention of the cotton picking machine may have. It may rid the South of its cotton slavery, and on the other hand it may cause the building up of big Southern estates. The one condition that has prevented a more rapid development of the big estates is to be found in the inability to secure cotton pickers during the season. You might buy ten thousand acres of land in the South and plant it all in cotton. You would be reasonably certain of securing a good crop, but there is where your certainty would end. To pick this big crop before battered down into the mud by heavy fall rains, you would need a small army of negroes, and anyone who has ever tried to employ a large number of negro cotton pickers will tell you that it is a task of doubtful issue. Even if you muster your army, a new recruiting campaign will be necessary after each Saturday pay day.

With a perfected cotton picker, the big plantation owner will be more independent than the wheat or corn grower.

Counsel to Virgins

Gather ye rosebuds while ye may,
Old time is still a-flying;
And this same flower that smiles to-day
Tomorrow will be dying.

The age is best which is the first,
When youth and blood are warmer;
But being spent, the worse and worst
Times still succeed the former.

Then be not coy, but use your time,
And, while ye may, go marry;
For having lost but once your prime,
You may forever tarry.

—Robert Herrick.

THESE SHEEP UNDER ELECTRIC INFLUENCE PRODUCED A TWENTY PER CENT. INCREASE IN WOOL.

GROWING STOCK BY ELECTRICITY

By

CHARLTON LAWRENCE EDHOLM

ACCORDING to Professor Silas Wentworth of Los Gatos, California, his observations of the influence of high voltage wires on animal and vegetable life during the past year have proved that electricity will more than double the normal increase of the flock and also greatly increase the yield of wool.

PROF. S. WENTWORTH. Los Gatos Experimental Station, Los Gatos, California.

On his experimental farm on the Tyler place, Roseville, California, a band of two thousand sheep was divided, one-half being placed in a field under the power wires of the Great Western Power Company, while the others were kept entirely away from all electric influence that might emanate.

In the field under the electric power line the production of lambs averaged a fraction over two lambs to each ewe. In the adjoining field where electrical influence was lacking the lambs averaged less than one to each ewe.

Similar difference, Prof. Wentworth declares, were noted in the wool yield. From the sheep kept in the electrically influenced field the fleeces proved not less than twenty per cent. heavier than those from the other sheep kept remote from such influences.

Preparations are now being made to plow up both fields and plant the grounds

in wheat. The power company will be requested to extend the power lines throughout the entire Tyler field so that the measure of the influence of the powerful electric current may be increased. Professor Wentworth declares that he is very confident that the yield of wheat in the Tyler field will be over 100 per cent. heavier than in the adjoining field.

These electric experiments are being watched with interest by the agriculturists and stock men of California as well as by scientists and the general public. That electrical influence has a great deal to do with both animal and vegetable life seems to have been pretty clearly demonstrated by the results of the tests thus far made.

Professor Wentworth, who is the author of "Atmospheric Dust," is the inventor of the electrical milking machine and was the first to announce that seismic disturbances are caused by heated limestones. He gave advance information to vineyardists throughout Europe to raise wine grapes during "the year of the Comet," and he claims that the present wine production of the year 1910 will command the greatest price of any modern vintage.

Sheep Grazing on Prof. Wentworth's Farm.

The Output of Lambs Was Doubled.

Tyler Field, Near Roseville, Cal., Used by Prof. Wentworth in His Electrical Experiments with Sheep.

Various experiments have been made in recent years with electricity, to discover its effect on the growth of plants. Prof. Wentworth, however, seems to be the first to discover the peculiar results treated of in this article upon animal life. In England, Sir Oliver Lodge, in conjunction with his son Lionel Lodge and some others, a couple of years ago produced some remarkable results by high tension discharge. One-year strawberries were made to yield an increase of eighty per cent.; five-year plants, 36 per cent.; cucumbers, 17 per cent.

EZRA MEEKER, STARTING TO PUT DOWN A MONUMENT TO MARK THE OREGON TRAIL.

TO BOULEVARD THE OREGON TRAIL

By

FRANK C. DOIG

FROM the Mississippi to the Pacific by boulevard,—2,500 miles, is the dream of good roads men of this country that will be realized within a few years. This great transcontinental path has been marked and $50,000 has been appropriated by the federal government to start the project.

It's the Old Oregon Trail, famed in history and romance, that will be used as the basis of the longest wagon or automobile road in the world. Stretching nearly half-way across the continent, over rolling prairies and through deep canyons, climbing and descending mountain ranges, offering all climates and flora known to North America, this national highway will afford the traveler in his modern touring car, experiences and sensations found nowhere else on the globe. Many of the famous highways of Europe and the eastern United States will be no more than peers of Pioneer Way, as the new boulevard will be called.

The great road, when completed, from St. Louis, on the banks of the Mississippi, to the shores of Puget Sound, will cross five states and enter two others. Following the lines of least resistance, laid out by the pioneers in the early forties with their slow-going ox teams and prairie schooners, the modern road will have easy grades and good foundations.

Although it is the intention of those who have the project in hand to have the boulevard constructed from St. Louis, the real Oregon Trail has its beginning at Council Bluffs. Going westward the first place of importance is Grand Island, Nebraska. At that point the trail branches, the southern path coming from Independence, Missouri. The section of the national highway across Missouri from St. Louis to Independence does not belong to the Oregon

PROPOSED ROUTE OF THE PIONEER WAY.

Trail proper, but will serve to connect it with the banks of the Mississippi river.

From Grand Island, Pioneer Way will take a northwesterly course across Nebraska, touching Lexington, North Platte and Scotts Bluff. Along the banks of the Platte river the trail winds westward touching those picturesque spots made famous by the early pioneers. Every settler who made the trip across the plains remembers Scott's Bluff rising 800 feet above the surrounding country and forming a guide post for the thousands of schooner drivers. On Pioneer Way it will be one of the most salient features of the eastern section.

THE MAN WHO MADE POSSIBLE THE NEW OREGON TRAIL.
Congressman W. E. Humphrey of Washington.

Continuing westward into Wyoming, Pioneer Way will follow the North Platte up into the Rocky mountains, by way of the Sweetwater valley. Where the Sweetwater river has cut its way through the solid rock the highway will follow. Passing those great natural land marks, Devil's gate and Independence rock, the Old Oregon Trail today can be seen stretching away to the westward, worn deep into the rock by the continued turning of thousands of wagon wheels and tread of hoofs. But today scarcely half a dozen wagons of any description pass over the trail in a week.

Up and up goes the trail, yet the traveler scarcely realizes he is passing over one of the highest mountain ranges on the continent. At South Pass the highest point is reached, where the rainfall of North America is shed like the water from a peaked roof. To the eastward flow the streams of the Mississippi, and to the westward the water that finds its way to the Pacific ocean. The scenery here is among the grandest in the world. To have climbed to this point in a touring car with little effort and to have surveyed the grandeur of Nature's handiwork is a feat that will make the most road-weary autoist feel life is worth living. Railroads have spanned the continent but none has taken a path that can compare to that of Pioneer Way. Here on the roof of the continent, not a sign of civilization's marring work can be found except the stretch of highway to the eastward and to the westward. For miles the snow capped peaks rear their jagged heads skyward, in every direction. Giant granite shafts line the canyons and the mountain torrents begin their long and tortuous journeys to the sea.

For one hundred and fifty miles Pioneer Way traverses the wilderness, far from the sound of a telegraph instrument or the voice of a telephone operator. On this stretch the traveler is from 6,000 to 7,000 feet above the level of the sea. The air is thin and bracing. There are no speed limits and no mounted police to regulate the traffic.

PIONEER WAY PASSES THROUGH VIRGIN FORESTS ON THE PACIFIC SLOPE.

There is little work here for the constructors of Pioneer Way as the trail is well marked and worn smooth. It is fifty feet wide in most places and worn three feet below the original surface. To the eastward of the summit the trail widens to one hundred feet and in places is fifteen feet deep in the rock.

From the pass the descent toward the Pacific slope begins. By easy stages the trail brings the traveler to Tortoise rock and then to Cokeville. The state of Idaho is entered near Montpelier and the route crosses the state by way of Boise, following the Snake river valley.

At Vale the path enters Oregon and there another gradual ascent begins toward the summit of the Blue mountains. Here again the shrewdness of the early pioneers is apparent as the grades are the easiest kind, and notwithstanding the ruggedness of the country the climb to

WHERE PIONEER WAY MEETS THE WATERS OF THE PACIFIC ON PUGET SOUND.
Tumwater, Washington.

the summit of the range is not hard to make. Once over this range the path leads to the banks of the Columbia river and continues down this valley to The Dalles, Oregon.

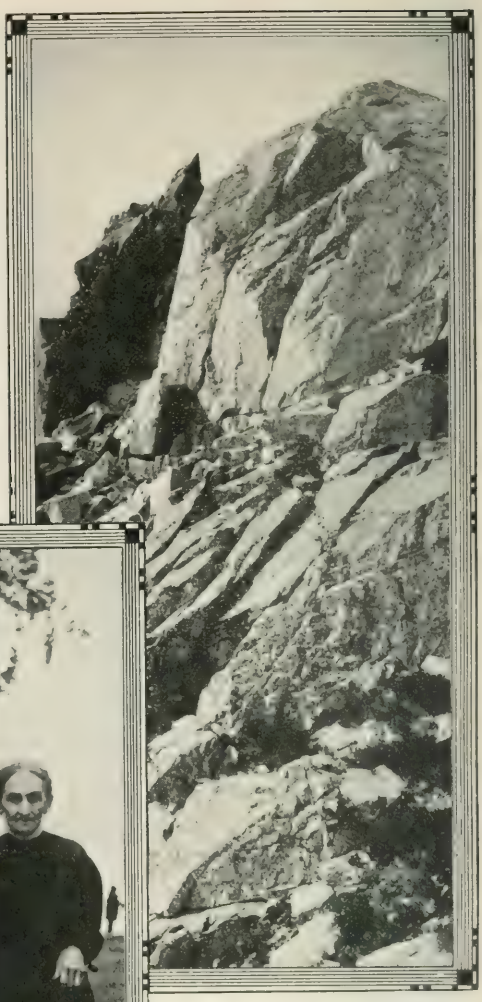
Here, "where rolls the Oregon" is the real end of the historic trail but not the terminus of Pioneer Way. From The Dalles the proposed boulevard will be continued down into the junction of the Willamette river. Crossing the Columbia at this point either by ferry or bridge the tourist may continue his journey over the trail taken by the settlers who claimed the Puget Sound country for the United States.

At last the waters of the Pacific are reached at Tumwater, Washington, at

CROSSING THE PLAINS ALONG THE ROUTE OF THE PIONEER WAY.

the head of Puget Sound, and the continent has been spanned. No bands of steel have been used in the spanning; nothing but the modern touring car made practical by utilizing the work of Nature.

That this dream is practical, has been demonstrated. Ezra Meeker, the pioneer who crossed the continent over the Old Oregon Trail in 1852, already has shown that the feat can be accomplished, again. He made the trip only a few years ago with an ox team and prairie schooner, in order to arouse public interest in the perpetuation of this national highway and not only save it from the ravages of the elements but make it a connecting link between the Middle West and the Pacific Coast.



GRANITE PEAK.
Here Ezra Meeker obtained rock with which to mark the Oregon Trail.

A MONUMENT TO THE MEMORY OF THE ASTORIAN EXPEDITION OF 1810. Nebraska's oldest continuous resident stands beside it. The expedition referred to was organized by John Jacob Astor's Fur Trading Company and its members were probably the first white men to traverse the "Oregon Trail."

That Meeker succeeded in his undertaking is proved by the appropriation of $50,000 made by Congress in passing a bill introduced by Representative William E. Humphrey of Washington, for beginning the task of surveying the path and marking it, so that reports can be made

to the government as to what will be necessary to acquire the trail for a national thoroughfare.

Mr. Meeker's undertaking was one of the most spectacular, yet quaint, expeditions ever seen in this country. From his home in Puyallup, Washington, he set out in his prairie schooner to erect monuments along the historic route. Driving his patient oxen to Tumwater, he set the first marker at the end of the Old Oregon Trail within sound of the waves of the Pacific. From there he journeyed eastward arousing popular interest in his undertaking and setting up stone and wood monuments at important centers.

This was the real beginning of the ambitious scheme to span the continent with a national highway. At times the sturdy pioneer, in his seventy-sixth year, met with discouraging reverses; at other times public sentiment was with him and his efforts were appreciated. Throughout the western part of his journey the enthusiasm of the people for the scheme knew no bounds. The westerners realized the benefits to be accrued as well as felt that the sentiment attached to the old trail should be recognized in some substantial manner. In the Middle West the encouragement given was scant. This feeling now however is passing away with the growing popularity of the motor car.

The days of the ox team have long since passed and the chauffeur has taken the place of the prairie schooner driver. The rattle of the wagon wheels has been succeeded by the chug-chug of the gasoline engine. In spite of the fact that distance has been overwhelmed by the locomotive, the big touring car has come to stay. With this march of progress it was natural that the national highway scheme should follow.

Aside from the historic associations that cling to the old trail, the easy-grade road connecting the Mississippi valley with the Pacific Coast will be of practical value. Unlike the Cumberland highway east of the Mississippi, the government so far never has spent a cent on the Old Oregon Trail. The pioneers simply pushed forth into the wilderness and made their own route. Following the lead of the first settlers, thousands

Pioneer Way Will Circle Around Mount Rainier.

of others followed in the footsteps of the leaders with their oxen, prairie schooners, cattle and sheep. In 1843 the great tide of emigration to the westward was at its height and in 1844 fourteen hundred settlers with their herds tramped over the trail. Three thousand more followed in 1845. Hardships, suffering and famine had no terrors for those seeking their fortunes in the far West.

No tolls except those paid in human and animal lives were accepted on this long trail through the wilderness. No roadhouses offered their hospitality to the travelers. Their homes were their prairie schooners and the blue sky was their roof. When rivers too deep to be forded were encountered, the wagon boxes, which were made water-tight, were used for ferryboats and the cattle were swam across.

"Shall we let the memory of such men and women smoulder in our minds and sink into oblivion?" asked Mr. Meeker, as he set out from his western home to mark the trail. "Shall we refuse to recognize their great courage and fail to do honor to their memory? We erect monuments to commemorate

achievements of grim war and to mark the bloody battlefields; then why should we not honor those who went out to the battle of the Plains?—a battle of peace to be sure, yet a battle that called for as heroic deeds and as great sacrifice as any war and fraught with as momentous results as the most sanguinary battles of history. The people who held Oregon with such firm grip till the sacrifice came that ended all contention deserve a tender place in the hearts of the citizens of the commonwealth."

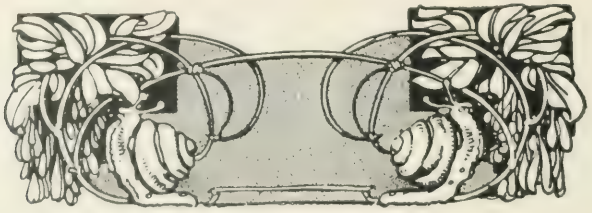
And so with this sentiment in mind the great task of marking the historic path was undertaken by the gray veteran of the plains. This trip of Mr. Meeker over the reverse route is now almost as famous as the original trek of the westbound pioneers. After carefully selecting and training his two oxen, Twist and Dave, Mr. Meeker made ready his canvas-covered schooner. This was an exact counterpart of his original wagon, even having one of the hubs used on the schooner that brought him westward in 1853. The idea was to attract attention and Mr. Meeker believed this was the best way to do it.

Mr. Meeker succeeded. Sentiment was aroused among the people along the route and suitable monuments and markers were erected. Now in the states through which Pioneer Way passes, it is believed legislatures will aid the federal government in the bigger task of putting the highway into shape for modern travel. Automobile clubs and good roads organizations in all parts of the country have endorsed the scheme and are working to have it carried out.

There are few places in the path that will require extensive or scientific attention. The trail is well worn in most places and with comparatively little work and expense it can be made a broad, smooth highway, passable at all seasons of the year, except in the dead of winter when the snows in the high altitudes might interfere with travel.

On the Pacific Coast the sentiment in favor of constructing the highway is strong. In the state of Washington a movement is on foot to build a broad state highway from the Canadian line southward to the southern limit of the state. This road would connect with Pioneer Way and thus give easy access to the entire Puget Sound country and British Columbia.

With Pioneer Way opened, a vista of enjoyment would stretch forth for the automobile enthusiast, such as he never before dreamed possible. The wilderness would take on a lively aspect and roadhouses and hotels would spring up along the route for the accommodation of the travelers. Nowhere else in America could the autoist get so close to Nature and at the same time have a road that would not tax the ability of an expert chauffeur to negotiate.



PULLING THE EARTH'S MOLARS

By

F. G. MOORHEAD

"THE time is not far distant when the northern portions of our country will be traversed with steam stump pulling machines which will travel from farm to farm and clear land at a certain rate per acre with the same frequency that the threshing machine moves about in settled farming communities."

This prophecy, made a short time ago by a Wisconsin man, is already being fulfilled. The stump-dotted fields of northern Wisconsin and Michigan are being freed of their encumbrances at the rate of one to three acres per day for each machine in operation. And the number of machines is increasing steadily, for they are proving themselves by pulling the knotty molars of the formerly forested earth and leaving in their wake stretches of cleared land ready for the husbandman's plowshare and seed.

The steam stump pulling machines are rapidly becoming the "painless dentists" of the northern woods. Following in the wake of lumber crews they are turning stumpy fields into fertile farms and reclaiming a vast empire of formerly wooded prosperity. Although in operation but a short time, one machine, working in Rusk county, northern Wisconsin, has cleared as high as four and five acres a day. As a steady diet, however, the machine does not devour the stumpage of much more than one to two acres a day. It does it at a cost of not more than fifteen or twenty dollars an

HOISTING A MEAN ONE.

GOOD WORKING GROUND FOR THE STUMP-PULLER.

acre, while the average cost heretofore, by horse-operated pulling machine, has been thirty-five dollars an acre.

The situation in the "cleared" portions of the heavily wooded states of the country has not been without its pathetic side. The noble monarchs of the forest were first marked for slaughter; then the logging crews passed on. In their wake, as the trees disappeared before the commercial rapacity of man, followed crews not above cutting the smaller trees, leaving behind them a stump-studded field barren of all save the striplings and the windfalls. Many a farmer lured from home by the tales of cheap lands in the timber states has found his land "cleared" but so dotted with stumps which fire, acid, pick and dynamite failed to worry or budge that he has given up in despair and joined forces, from very necessity, with the logging crews to "clear" another section and go on their way, leaving a trail of fallen monarchs and blasted agricultural hopes behind.

Hope, however, is returning, for former stump-ridden fields now converted into prosperously yielding farms stand as object lessons to inspire other farmers to turn to the new "painless dentists" of the earth. Already the days when the stump pullers shall move from farm to farm, blazing a trail for the threshing machine, has dawned. Several hundred acres were ridden of stumps

A YEAR LATER—BEARING CORN AND POTATOES.

DELIVERING A PULLED STUMP TO THE PILE PREPARED FOR FIRING.

in northern Wisconsin alone last summer and already plans are being laid for a dentistry campaign in 1911 which shall pull the earth's molars in a wholesale fashion.

The advantage of the new steam stump puller is that it solves the problem of getting rid of the stumps as well as of pulling them out of the earth. The stumps are pulled alongside the machine and piled in heaps ready for the flaming torch. Many reasonably high-priced horse power machines can pull the stumps, but these machines have never succeeded in disposing of them and until they have been "long lost to all but memory's aching sight" the stump encumbrances do not cease to be a nuisance and a hindrance to cultivation.

The engine on the machines which proved their worth in northern woods last summer is a ninety horse power, three-drum upright. The main pulling drum has 750 feet of heavy steel cable and has sufficient pulling power to dislodge the largest pine stump and is capable of pulling in (to the machine alongside of which the pile is made) three or four stumps at a time. The second drum is a re-haul and has 1,900 feet of lighter cable. The third drum is for the purpose of piling the stumps and has two hundred feet of light but strong cable which runs up over the large swinging boom or "jammer." The entire machine weighs approximately twenty-two tons. It is mounted on iron skids or runners and can be removed from place to place by its own power.

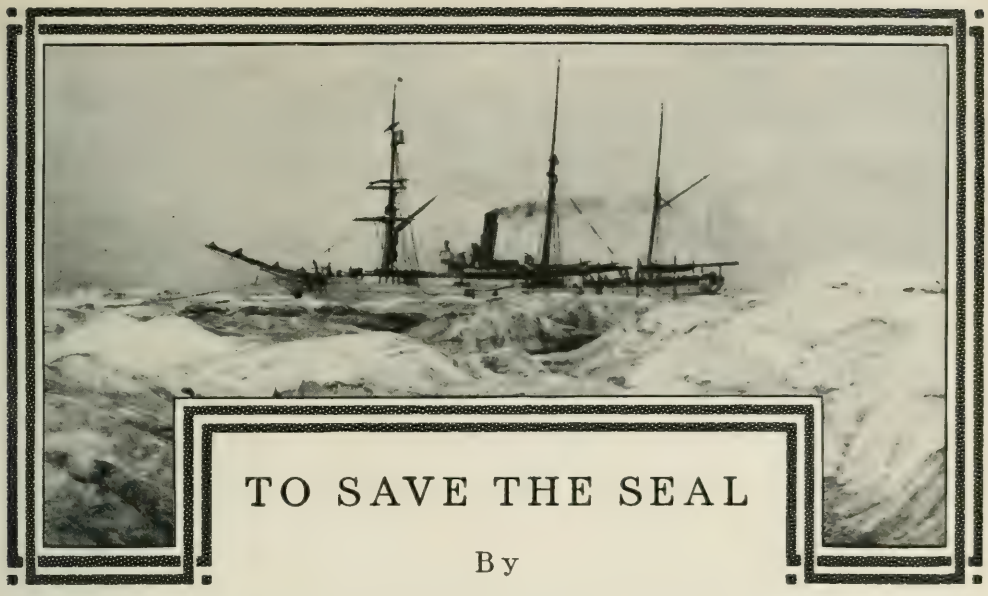
In commencing the clearing operations on a tract of "cut-over" stump land the main pulling cable is fastened to one or more large stumps and then the machine is skidded by its own power to the location where the machine is to work. With the machine in place, next the anchors are driven into the ground to hold it. The 750 feet of pulling line is run out to its full length straight in front of the machine. Then the 1,900 feet of haul back cable is run out in a half circle and fastened onto the end of the pulling line. This re-haul cable runs through a series of steel blocks. On the end of the direct pulling line are several hooks. A series of short cables fifteen feet in length, known as choker lines, are used for fastening around the stumps. One of these choker lines is placed around a big pine stump and then fastened into the

STUMPS AND WINDFALLS GATHERED FOR THE BURNING.

hook at the end of the pulling line. In case the stumps are not too large, two or three can be fastened in these hooks at one time and pulled in together. As soon as the stumps are pulled up to the machine the short choker lines are unhooked, new choker lines are hooked to the main cable and the re-haul immediately sends back the cable to the field of operation. Two men at the machine unhook the choker lines from the main cable, fasten the piling cable to the stumps, which are drawn to the top of a large swinging boom and swung to the side of the machine, where they are dropped upon the pile by means of a trip operating somewhat similarly to the trip on a hay fork.

Approximately eight acres of land can be cleared at one setting of the machine, thus making but one pile of stumps for every eight acres. Inasmuch as there is practically no soil left adhering to the roots the stumps are easily burned, the resinous oils of the wood making them ready fagots of destruction. Fiercely burning bonfires mark the conquering path of the stump pullers and blaze the way for the next farmer, who finds his acres, formerly of no practical commercial value to him, ready for cultivation.

What the effects will be it is not difficult to compute. Thousands of acres of land have lain idle since the timber crews passed over them, cutting the trees and leaving only the stumps and the windfalls behind them. This land is as fertile as any to be found anywhere in the states, but it has been an expensive and well nigh impossible task to pull the stumps fast enough and cheaply enough by horsepower machines to make the job worth while. Now these acres are slowly but surely being given over to cultivation. Some of the best crops Wisconsin yielded last year were grown on stump-eradicated fields which had had absolutely no value as farming land a year or two before. A beginning has been made and the next few years bid fair to see the tillable area of the Northern states increased and the crop yields augmented, with the "smile that won't come off" illuminating the face of the farmer who not long ago scowled perplexedly at his stumpy fields and wondered what on earth to do with the earth at which he could hardly get with his plows and seeders and reapers, because of the molars which encumbered it.



TO SAVE THE SEAL

By

WILLIAM THORNTON PROSSER

A PREY to the greed and rapacity of many nations for decade after decade, the fur seals of Bering Sea seemed on the verge of complete extermination, but the remarkable accomplishment of one man, and he neither a scientist nor yet a diplomat, promises to conserve the Pribilof rookeries for all future time, providing the United States government gives proper employment to the knowledge it has gained. In late years the Japanese have been the greatest foes of the seals, and have slain thousands upon thousands of seal mothers that have left their pups ashore while they sought sustenance many miles out in the ocean. The discovery is that of Boatswain J. Thurber, of the United States revenue cutter *Bear,* who has learned how to feed these orphaned baby seals and rescue them from the starvation that hitherto has been their unfortunate lot.

With the fisheries bureau at Washington, D. C., are eleven infant seals, brought down from Bering Sea on the last voyage of the *Bear,* and they are thriving so well that the fisheries officials are convinced the key to the salvation of the northern herds is in their hands. And credit for this is due to no other than the revenue cutter's kindly bo'sn who loves the seals as fellow-creatures, and who knows more about them and their habits "than all the rest of us put together," as the officers of the *Bear* proudly assert.

Left alone upon the rocky shores of the bleak Pribilof islands the motherless young seals have no hope before them but death, as the social regulations of the rookeries—as carefully governed as a hive of bees or a hill of ants—prevent any other seal mother from giving nourishment to the orphan. Experiments have been made frequently suckling the baby seals upon milk-bottles, but these have met small success. Bo'sn Thurber found that by snapping a ligament in the mouths of the young animals and working with their gums to aid the progress of the growing teeth, the youngsters were enabled to eat fish and other solid foods, and can be made to grow as rapidly as they do amid native environments. While the federal government cannot keep the Japanese sealers more than three miles away from the rookeries it can at least take care of the seals that are orphaned by the slaughter of the mothers, and eventually will find itself well repaid for the outlay, as the pelt of every seal is worth $40 in the London

NATIVE ALEUTIAN ISLANDERS WHO GAIN A LIVELIHOOD BY THE SLAUGHTER OF SEALS.

fur market where, of course, there is a great demand for them.

When the *Bear* left northern waters in 1909 she carried two orphan seals as the pets of the boatswain. These at first were nursed upon a bottle, but did not make satisfactory progress until Thurber found he could hurry the course of nature by removing from their mouths the hindrance to their consumption of solid foods. This object attained by the breaking of the ligament in the mouth of each baby seal, the lively little orphans gobbled up fish and other food from the sea with a voracity that surprised their keeper. So great a success did Thurber make of this experiment that he went to Washington with his two pets and convinced the fisheries bureau that he had solved a most important problem.

So when the *Bear* sailed for the north again at the opening of this last season Thurber carried authority to bring back a number of seal pups to be taken direct to Washington and there experimented upon during the winter. The eleven youngsters occupied a tank on the *Bear's* deck when the revenue cutter sailed into Seattle harbor early in November.

"They're the brightest animals in all the world," declared the proud boatswain and keeper of the baby herd. "Are there any smarter trained animals in a circus than the troupe of seals? You can teach them almost anything. They're affectionate and playful, and their bright eyes seem almost human.

"It's a mighty interesting study — that of the seal herds. Year in and year out I've been going into the Bering for a dozen seasons and more, but every time I go near the Pribilof islands I learn something new about the noisy colonies upon the rocky beaches. And to go among them and hear the faint cries of the starving orphans, whose mothers have been slaughtered by the Japanese sealing schooners makes your heart ache.

"If those poor baby seals can be saved from such a fate I think I will be the happiest man in the world.

"These pups that we brought down with us were born in June, and they have thrived so well that they are pretty good sized animals by now, for the seal grows very rapidly. Each year the herds swim several thousand miles to the southward, into the Pacific Ocean, going as far down as San Diego, Cal., and in the spring return by way of southeastern Alaska and the Alaskan gulf to the rookeries.

"This year for the first time in three decades the United States government has had sole charge of the Pribilofs, and about 13,000 skins were taken. But the loss of these does not seriously affect the welfare of the colony, for it is the useless bachelor seals who are made to yield up their pelts in the interest of fashion. The catch this year was worth $500,000. For thirty years the islands were leased to a private concern, which was limited to a certain catch."

The boatswain believes that seal raising could be commercialized and carried on most profitably.

"That's my ambition now; I want to get some one to give me a start, and we will make our fortune from a rookery all our own," he says. "There is no reason in the world why the seals cannot be propagated in captivity, and I believe that seal farming will be one of the industries of the future.

"Or the animals could be colonized in

SEAL FAMILIES ON PRIBILOF ISLANDS, AND A BULL AND HIS HAREM.

their natural state. Islands just as well adapted to rookeries as the Pribilofs are plentiful along the Aleutian chain, and it has been demonstrated that the seal will always return to his native shores. Therefore the colony would come back each year from its pilgrimage—unless the Japanese sealers were too alert."

The keeper of the seals wears heavy gloves as he feeds and handles his charges. Their sharp new teeth lacerate the bare skin.

The eleven youngsters upon their arrival in Seattle were taken to the University of Washington, and a few days later were transferred to the special car of the fisheries bureau, in which they were transported across the continent.

Almost every season the staunch old cutter *Bear* is the first vessel to poke its nose among the icebergs and floes of Bering Sea, and on into the Arctic Ocean. Hundreds of lives has the *Bear* saved, for each year she is able to give assistance to wrecked vessels or starving castaways upon those northern shores. Many a disabled whaling vessel has she succored in the Arctic. Equipped with the strongest wireless apparatus that goes into northern waters she keeps in constant touch with the big vessels, and frequently aids them in communicating with the shore. This last year the *Bear*, while sailing northward on a voyage from Nome, rescued the passengers and crew of the gasoline schooner *Joe Matthews*, wrecked in Golovin Bay, and performed a similar service for the human freight of the schooner *Helen Johnson*. Not until the last vessel is out of the Arctic for the winter does the *Bear* sail for the south.

Capt. E. P. Berthof also has a somewhat unique function to perform, for he is the representative of the law from Dutch Harbor to Point Barrow. As a specially constituted United States commissioner he is a court upon the main. Natives as well as white men in doz-

THE MAN WHO DISCOVERED HOW TO SAVE THE BABY SEALS.
"Bos'n" J. Thurber of the U. S. Revenue Cutter *Bear*.

ens of lonely spots far up under the Arctic circle each year await his coming to settle their disputes and decide their litigation. After years of service he has gained a reputation for fairness so universal that his word is the last resort. Many a whaler captain lies in wait for the old wooden cutter and makes her master decide disputed division of the season's catch.

Even the domestic relations of the natives must be untangled by Captain Berthof. Crimes he punishes by imprisonment in the ship's brig, and it behooves the captain to make his sentences conform to his itinerary. "There's never a law of God or Man runs north of fifty-three," was spoken before Captain Berthof's time.

Of all the cutters in the revenue service the *Bear* has had perhaps the most interesting history. Presented to the United States government by Queen Victoria to take part in the Greely Relief Expedition in 1884, she rendered valiant service to the then Captain Winfield Scott Schley, later of Santiago fame. Her prow is sheathed with Australian ironbark wood, said to be the toughest in the world, and with her oak timbers she is less fearful of the terrors of the Arctic ice than the new steel ships that can outspeed her many points. She was also used by Capt. D. H. Jarvis in his memorable rescue of the starving whalers of Point Barrow a few years ago.

Three cutters besides the *Bear* went into the Arctic this last year to aid commerce, rescue life and patrol the seal rookeries. They were the *Tahoma,* the *Manning,* and the *Perry,* but the *Perry* met an unfortunate end, striking upon a rock. Her bones are breaking to pieces amid the winter storms.

Good news for the seals comes from Paris, for 'tis said that furs are no longer in the vogue of fashion. Could she have heard from afar the bleating of those orphaned baby seals whose mothers had been slain to adorn her beauty, perhaps Milady these many years would not have been so imperious in her demands for the furs of the Pribilofs.

The Day is Done

Read from the treasured volume
The poem of thy choice
And lend to the rhyme of the poet
The beauty of thy voice.

And the night shall be filled with music
And the cares that infest the day
Shall fold their tents, like the Arabs,
And as silently steal away.

—LONGFELLOW

THE TWENTY MILLION DOLLAR CHICAGO & NORTHWESTERN STATION COMPLETE.
View from the southwest. Madison and Clinton Streets.

TWENTY MILLIONS FOR A STATION

By

JOHN ANSON FORD

"NOW let me see if I have this story straight"—it was a young school mistress who was speaking. "You say he sat at the train dispatcher's keyboard for thirty-six hours; he personally directed the transportation of those thousands of troops, then just as the whole army had arrived at its destination, an order came to carry it back; and this same young man did not give up until the job was finished. How long did you say he was at his post, seventy-two hours?"

"Yes," repeated the man of affairs who had been relating the incident, "that young fellow was a division superintendent for the 'I. C.' railroad during Civil War times and the story is that in the midst of a big rush of business his division got orders from Washington to 'transport those troops at once.' The overworked train dispatchers went all to pieces and the rest of the trainmen had a panic. Things looked pretty blue. But one fellow kept his head—the division superintendent. He sat down at the dispatcher's key, rolled off those trains one by one, and never gave up, they say, until every Yankee soldier was past the last switch. Then, like lightning out of a clear sky, came the order 'Move troops back at once.' Was that fellow floored? Not much! He did not

let up until he got those Yanks on free soil again and every engine back in the round-house! Now that's what I call nerve!"

The teacher thought a moment. "I am going to tell my United States history class that story," she said.

"I don't know how long he slept after the three days' job was over," the man concluded, "but when he woke up, he found he had been made superintendent of the entire road. His name was Marvin Hughitt, and for the past twenty-four years he has been president of the Chicago and Northwestern road. The other day he retired at the age of 73 to become chairman of its board of directors."

The brains, perseverance and natural force combined in the person of Marvin Hughitt have been the chief factor in the phenomenal success of this transportation system which has spread over the northwest. Without such success it would not be able today to spend $24,000,000 in perfecting its terminal facilities in the city of Chicago. When the new station, which faces south on Madison street between Clinton and Canal streets is opened, 290 trains with a capacity for carrying 85,000 people daily, will steam in and out of its gigantic train shed. Ever since the completion of the annex to Wells Street Station, less than a decade ago, the road has realized that its Chicago terminal was inadequate. By official count of the police 60,000 pedestrians pass over the narrow Fifth Avenue bridge daily, most of them to and from the depot, with the result that traffic is terribly congested during rush hours. As the main stream of the Chicago river has been an obstacle to pedestrians going to and from the depot, so North Branch of the river has been an unending cause of delay, as all Northwestern trains must cross a jack-knife bridge spanning it. Trains to the new terminal will not cross the river.

AMPLE PROVISION IS MADE IN THE TRAIN SHEDS FOR ENGINE SMOKE AND SKYLIGHTS.

In the office of one of the high officials of the road there has stood for months, on a great oak easel, a huge architect's

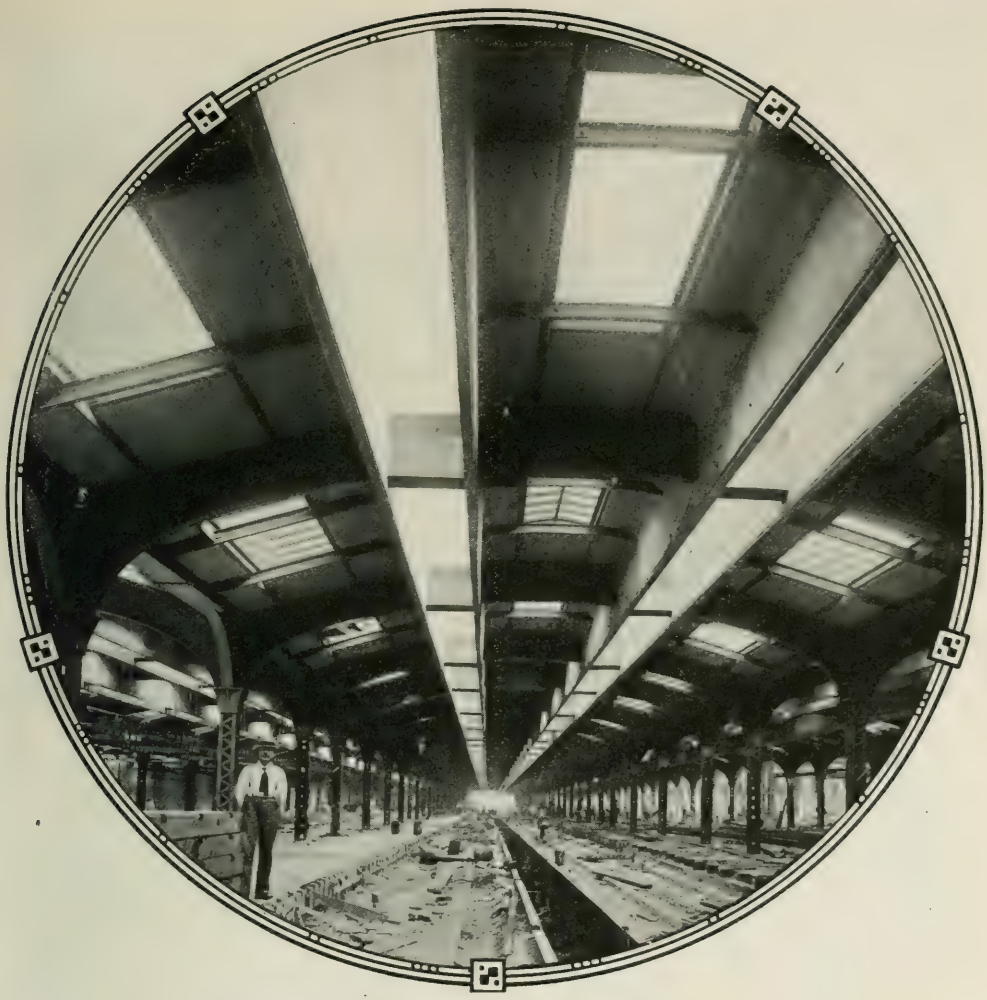
THE STATION WITH TRAIN SHEDS, AS SEEN FROM THE NORTH.

sketch of the new terminal, a beautiful portrayal in colors. Even before the wrecking crews had begun to clear the thirty-seven acres of city property to make way for this mammoth structure and its approaches, directors and messenger boys alike would steal up to the eighth floor of the general offices on Jackson Boulevard to admire that sketch. To them it was more beautiful than a copper etching or Turner landscape, and each one felt that he was helping make it possible. The great station with its six gigantic Doric columns is now a reality, and within a few weeks the millions of suburban and transcontinental passengers who formerly crowded up and down "the annex" stairs or through the old station, will be hurrying through the exquisite marble corridors of Chicago's newest and greatest portal to the west. Entering the building from Madison Street, one passes huge granite columns sixty-one feet high and finds himself in the public concourse, occupying a large part of the street-level floor. Here also are the ticket offices, information bureau, telegraph offices, baggage rooms, etc. The groined arches remind one of the crypts beneath the cathedrals of Durham or York. Mounting the majestic staircase one stands in the great waiting room, the most striking feature of the building. Its barrel-vaulted ceiling rises forty or fifty feet above one's head, like the nave of St. Peters. It is supported on either side by highly polished pillars of Greek Cappolino marble. The walls are of dull finished pink Tennessee marble and contrast strikingly with the green of the pillars. Semi-circular windows sixty feet in diameter light the room from either end and ten smaller lunettes pierce the vault on either side. The ceiling and walls are fitted with incandescent lamps, aggregating 75,000 candle power. The waiting room is directly connected with the train platforms, of which there are eight, with a combined length of over 7,000 feet. The sixteen tracks are covered by roofs of steel and cement, with a total area of over six acres, making it one of the largest in the world. The total area of the terminal in question is almost identical with the total area of

A CORNER OF THE GREAT WAITING ROOM—UNCOMPLETED.
Highly polished pillars of Greek Cappolino marble—green in color—support a barrel-vaulted ceiling, the arches of which are of pink Tennessee marble.

the new Pennsylvania terminal in New York.

In the general offices of the road on Jackson Boulevard, Chicago, there is a good deal more than the architect's water color to guide the terminal engineers. The eighth floor is given over almost wholly to the engineering department and in the days when draftsmen were preparing the detailed sketches for terminal construction work half a hundred men were needed for the task. In a very real sense the atmosphere in this department is "blue." Here are blue prints showing



THERE WILL BE NO SMOKE IN THE TRAIN SHEDS.
The roofs are low, and the smoke stacks of the engines will protrude through openings made for this purpose.

details of 530 working levers for high and dwarf signals, for switches, double slip switch points and movable frogs. Here are blue prints of the eighteen miles of tracks, included in the terminal section and the west and north approaches; here one can learn the location of the 186 caissons which were sunken, many of them 120 below the terminal to solid rock. There are all of these things and thousands more that the average man does not understand.

But there is one man who does understand—that is W. C. Armstrong, terminal engineer. After the "boys" of the engineering office have gone home, you can find him still at his desk; often he is poring over those blue prints. He is not given to talking about himself, this great engineer upon whom rests the responsibility for this costly terminal. "Yes," he said, leaning back in his chair and looking mildly at his questioner from under shaggy eye-brows, "I presume it does *look* like a big proposition to build a terminal such as ours and I suppose it is, but it does not *seem* very big. You see we began a long while ahead," he said slowly, "and then did one thing at a time." Unconsciously he had revealed

WITHIN A SHORT TIME PASSENGER TRAINS WILL BE SWINGING AROUND THIS CURVE INTO THE NEW STATION.

one of the secrets of the road's success—careful planning and looking ahead, then doing each thing in its turn as it came along.

"The first great big task," he continued, "was the fight we had in the courts to secure the property on which the station and tracks are built. Owners contested our right to condemn the property. The matter was in the courts for months. You can imagine the mountain of legal business before us with those hundreds of property owners to fight. But at last we won. Then we had to have the property appraised. But as I say, do one thing at a time, don't worry about the rest and you get along very well." This man spoke in such an offhand way that a stranger would not have suspected the intimate relation between him and the mass of blue prints just outside his private office door.

Tradition tells us that the great Lincoln cathedral stands on ground once occupied by 166 cottages and shops. Here is a structure which, with the right of way of its immediate approaches, covers thirty-seven acres, twenty of which were occupied in 1906 with 455 buildings. These were not mere peasant cottages either. Sixty-six of them were four stories or over in height. The task of clearing this thirty-seven acres in the heart of Chicago was vaster than any pioneer or group of pioneers ever attempted in the primeval forest. A forty-acre clearing of the early days cost perhaps a thousand dollars in labor. Here is a "scant forty" that cost, legal expenses and all, $11,560,000! Only master minds can conceive and construct such a railroad masterpiece and it will stand for centuries as one of the monuments to Chicago's greatness. It will be exhibited with pride even when our long-looked-for neighbors, the Martians, arrive on this terrestrial sphere. They will be more impressed by such works of peace than by our achievements in war—and that in spite of their reputed warlike character. It is entirely probable that out of their age-long canal experience they will tell us the defects of the Panama Canal but not so our modern

terminals. The eighteen miles of cement-bound track embankment, containing 265,000 cubic yards of cement, which radiate from this station will call forth only admiration from them, whether or not they approve of locked or sea level canals. Long after transportation by rail has become obsolete the work of these last four years will stand as does the wall of China today, a silent witness to the indomitable energy of another age.

To get a conception of the vastness of this engineering feat, one must understand that every hour of the day trains were run over these tracks while they were being elevated. In the minds of many, this has been the most remarkable feature of the work. Simplified, the track engineers' program has been as follows: "Run a load of gravel on the track; dump it; clear off the rails; jump out of the way and let a fast train shoot past; work "like blazes" with shovel and crow-bars and pry up the ties an inch or two; shovel an inch or two of gravel under the ties; get out of the way for a flyer! 'tamp' in a little more gravel; dodge another train"—and so on *ad infinitum*. But this is indeed the simplified program. The manner of installing the half-hundred viaducts, changing scores of switches and solving unnumbered other problems, remains a mystery

NOT SNOW BUT CONCRETE.
The tracks as they approach the station.

to the ordinary man. Suffice it to say, the work is done and with marvelous skill. Armstrong, terminal engineer, can furnish the particulars.

No better illustration by way of contrast between the old days and modern days can be found than in the quaint custom of one of the first presidents of the road which formerly owned the Wells Street Station and was bought by the Northwestern line many years ago. The Chicago depot then as during President Hughitt's administration was on Wells Street just north of the Chicago River. Since in those days there was no telegraph, traffic was frequently annoyed by inexplicable delays, even as it sometimes is today. The resourceful railway president, however, partially overcame the handicap. His office was located in the second story of the frame passenger station. It commanded a splendid view of the prairie and iron-railed tracks stretching to the west. History tells us that as the time for one of the two or three daily trains drew near, the predecessor of our modern railroad magnates would climb up into his turret-like office, take a well-kept marine glass from his desk and spy down the track to the west. On a clear day, we are told, he could see the swell-topped smokestack of his engine puff into the "distant" station of Austin (six miles away). Due notice would thereupon be given to the waiting Fort Dearbornites below, and, in the course of half an hour, the train would arrive with pioneers from Wheaton, West Chicago and adventurers from the even wilder and woollier region of Galena. But even though the president of the road has long since given over to others the function of train-calling, he has not lost his personal touch with its management or his personal interest in such great projects as the terminal.

The other day Mr. Hughitt was asked for a few facts regarding his life, for publication in connection with recent important events in the road's history. He may or may not agree with Woodrow Wilson's anti-trust dictum that "guilt is personal," but his answer would indicate that he did not believe the corollary that "corporate success is personal." When the significance of the request was made clear to the old gentlemen he straightened himself up and delivered his mind in this wise: "You want facts regarding my life? Why, sir, do you know that for the last quarter of a century I have been fighting to keep myself in the background? The papers have printed any amount of material about me but not a word of it has been authorized. All that I authorize regarding my life is published in the history of the road."

We looked and found that this official biography, instead of filling half the volume as we expected, was just twenty lines long! It began: "1852, Telegraph operator at Albany, N. Y."—and it ended: "1910, Chairman Board of Directors, C. & N. W. R. R."

Then, in this same conversation, this giant of the railroad world made perhaps one of the most significant statements in his entire official career.

"You must remember, sir, that there are a great many thousand men who are putting their lives into this road just the same as I am. Do you suppose I am going to have this road known as the 'Hughitt line'—and it might have been that way—when all these men are putting in their lives the same as I? No, sir, my biography is in that little railroad history."

So that has been his way of doing business. That is the spirit in which he has led an army of thousands which has blazed a trail from the shores of Lake Michigan to the Pacific; it is that spirit which actuates the new president, W. A. Gardner, and it has been in that spirit that the $24,000,000 terminal has been built—"a great portal to the west"—the crowning glory of the road and Chicago's greatest terminal.

HOLSTEIN CATTLE BEING TAKEN TO THE STOCK JUDGING RING.

STATE FAIR AND THE CITY MAN

By

EDWARD I. PRATT

THE gulf between city dweller and ruralist is rapidly narrowing. The farmer's convention is no longer a rabble of "rubes." The farmer is beginning to learn that good business is the same at the pig pen as in the machine shop.

The hayseed of fiction and fact has always been a good driver of bargains, but in the past, selling stuff off the farm was what concerned him most. Now he knows that the cost of producing the stuff on the farm is just as important as shrewd selling. He has caught the factory idea. He is prosperous.

But—it's Fair time now—let us investigate. We motor to the fair grounds. The first thing we notice is that farmers are motoring to the fair grounds also. They pass us as many times on the road as we pass them. A prominent motor car manufacturer has just figured out from recent statistics that in the past twelve months sixty per cent of the cars sold have been to farmers.

As our car waits in line at the wide spreading entrance, the sidewalks in all directions black with people, and hundreds in line before a dozen ticket windows; the contrast between this great institution and the fairs of ten and twenty years ago is brought vividly to mind.

The old time fair, forever gone, with its mediocre stock and exhibits, overrun with side shows—the race track its liveliest memory—was largely but a holiday for the country folk and the whole show a good-natured joke of the city man. And yet the fair of the past has surely pointed the way to better agriculture.

Before us, covering forty acres, with

ONCE THE WAGON OR CARRIAGE—NOW THE AUTOMOBILE.
Farmers at the State Fair.

immense buildings holding the finest stock and agricultural products of the world, lies the state fair of 1911.

Power is master. Its energy is everywhere. The busy hum of motors silences the cry of the sideshow man. The beat of a hundred gasoline engines sounds the doom of drudgery, tells of better production, more of it. The gasoline engine is the new "hired man," demanding no salary, with slight appetite.

It does the housework, too, washes clothes, churns butter, pumps water, in fact, as a general farm hand, is a most important factor in lowering the cost of production. Its widespread influence is apparent everywhere at the fair, where dozens of makes and sizes, from tiny engines no larger than a teakettle, puffing busily away, separating cream, and doing chores on the farm; to the powerful engine operating big ensilage cutters and threshing machines.

We see long aisles of these engines in many shapes, grinding feed, sawing wood, pumping water, separating cream, operating fanning machines, huskers and shredders, and controlling a dozen other important phases of farm work that heretofore were left to the itinerant hired man at thirty dollars per month, board and room.

Model for Barn and Silo That It Might Be Well to Follow.

The inventor of farm machinery knows that this hardest problem of the farm today, the labor question, must be solved by machinery, and at the fair we find machinery for almost everything; from milking apparatus to automatic hog

feed grinders, where piggy grinds his own dinner before eating it.

We linger at the machinery exhibit as the most fascinating for here the inanimate—iron rods and wooden beams—are endowed with life for accomplishing all the varied tasks of the tiller of the soil. Could our great grandfather visit the thresher and stacker division of any of our great fairs this year, he would be amazed to see mammoth creations on wheels, looking for all the world like the strange creatures geologists have pictured for us from the records of long past ages: huge, long-necked stackers, the dinosaurs, with mouths gaping forty feet in the air, belching clouds of straw and chaff, just to show how today the farmer can thresh his oats and rye and stack his straw in one-tenth the time that his grandfather labored to the same end.

There are new plows to turn the earth better, with easier draft; horseless mowers, hay rakes that earn their cost in the hay they save; milk-handling machinery with which the dairyman can give us better and cleaner milk at less cost.

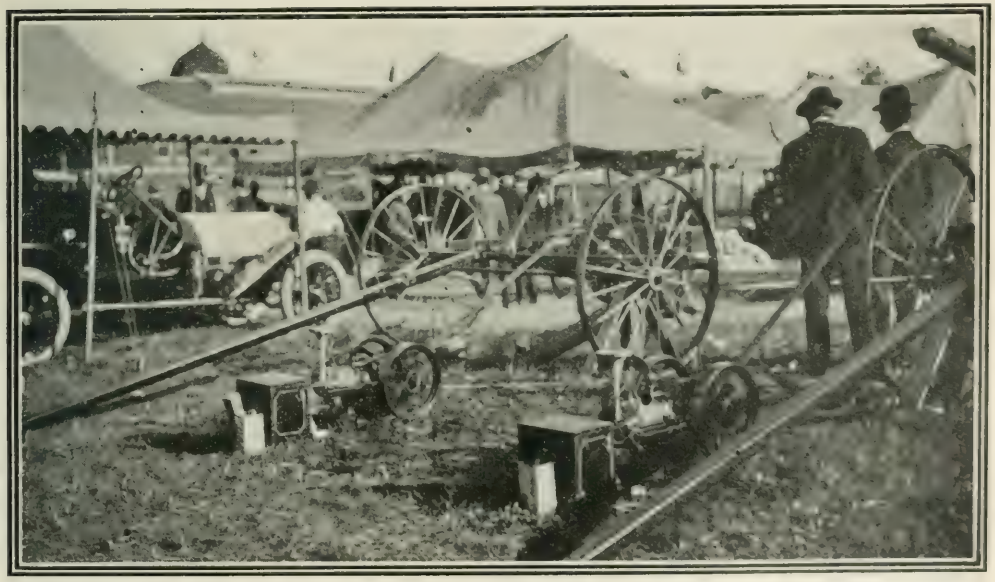
Then there is concrete-making machinery with which the farmer puts up fireless barns and tramp-proof hay mows that enable him to sleep unmindful as to whether the hired man upsets his lantern

New Type of Machine for Making Over Old Highways.

or takes a siesta, pipe in mouth, behind the barn.

Add to these, small complete lighting plants to light his house and barns for the price of the oil of a dozen dirty, foul-smelling lanterns. In fact, there are now on the market, systems by which the farmer can operate his small dynamo with water wheel, using water elevated to tanks by windmill or gasoline engine.

Next to power, economy in production is an evident cause for farm betterment as shown by our state fair. Economy in the use and sale of by-products is the success of many manufacturers today;



MINIATURE GASOLINE ENGINES IN FOREGROUND TO DEMONSTRATE HAY RAKE OPERATION

but not until farm machinery had become generally practical, were many present day economies possible in dairy and field.

Here, in the power exhibit, we see easy-running treadmills run by dog or sheep for separating cream, churning, etc., and large tread power operated by horses and cattle. On many large dairy farms, cream separating is done with tread power by using one of the herd bulls that would otherwise be idle. Separating the cream on the farm is in itself an economy as it saves horse power—the hauling of many pounds of milk, sometimes miles, to the creamery daily.

The increased efficiency of modern farm machinery in every department of farm work is added economy. Better manure carriers and spreaders, better disk drills, corn planters and harvesters, fanning mills, harrows, cultivators and feed-grinders mean added profit to the user.

In the vehicle department, aside from the varied exhibits of farm wagons especially built for each particular kind of work, we find the automobile the center of attraction—big touring cars and little runabouts, no fancy limousines with hand mirrors and flower vases, but medium-priced, practical cars built for wear and country roads. Automobiles filled with family parties, well-dressed, are touring the grounds; some from city and some from country. One distinguishing feature is that the farmers' cars don't contain women with hobble skirts and pinned-on curls.

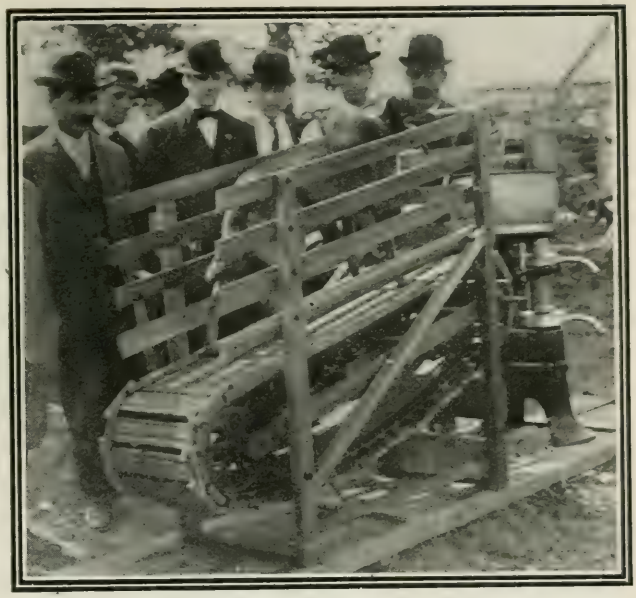
Around us is a maze of handsome structures. An immense livestock building, a judging pavilion costing $30,000.00, a dairy building built of concrete, tile-lined, with huge glass-sided refrigerators, for butter and cheese exhibition in the center, is a model of its kind. And so it goes, most of the states constructing better and finer buildings each year, as these are principally for educational purpose. The New York Legislature last year apportioned $2,500,000 for new buildings, etc., for the state fair develops state pride, and broadens the views of both city man and country dweller. We hold an annual state fair in thirty-eight of our states at present, and the attendance grows in numbers at every convention. The attendance at the Minnesota fair numbered over 300,000, that of Iowa over 200,000 and Wisconsin was well over 100,000. The great advancement in all the branches of agriculture, horticulture and livestock is due greatly to this source.

It has been said that while the county fair was the farmer's high school, the state fair is his college. In addition to the regular farm buildings, we find a model barn and silo, not expensive, theoretical structures, but a "poor farmer's" barn, built by farmers, within the average man's means yet thoroughly practical. By following out time-saving conveniences in this barn, a farmer can save hundreds of dollars in avoiding time-wasting and awkward arrangements of stalls, feed bins and silos.

In the model farm home is shown a low-priced house with a model kitchen and system of ventilation. One farmer's wife remarked that it was nearer her idea of heaven than she ever hoped to see on this earth. With the small gasoline engine for chore boy and maid-of-all-work, more rest for weary hands

The Practical Features Are Evident on the Automobiles for Farmers

and feet, and more time for study and intelligent planning of household affairs seems possible; and the low price of $50.00 for the all-round household worker that can do the pumping, churning, even sweeping and cleaning, run the washing and sewing machines and mangle for ironing, brings it within the means of all and would mean an untold boon to any housewife.



How the Family Pet May Be Utilized.
Dog operating treadmill.

In like manner a model schoolhouse, complete, is open for inspection; the high ceilings, large windows, good heating and ventilating facilities showing its value as an example to village fathers. The windows are on three sides, reaching from a distance of about three feet from the floor almost to the roof, and the cheery warm rays of the sun pour in from these windows which may be easily raised or lowered to let in any amount of fresh air, making of the schoolroom a chamber that children love, and thrive in.

The practical teachings that are given each day in some department during the fair week do more to really help and instruct the farmer, the fruit-grower, and the housewife, than all the books that are read throughout the year on the same subjects. Whatever one is interested in, from the raising of African geese or pedigreed barley, to the newest methods of educating the children, he may attend lectures and see practical demonstrations along his own particular line that will awaken new interest and give him wonderful new ideas to plan out in the future for the betterment of his own individual work.

The Kind of Building the "Little Red School-House" Should Be.
Model displayed at a State Fair exhibit.

Besides comprehensive exhibits of road machines we find a state department of roads offering booklets, charts on road management and directions for building road drags. The farmer buying motor cars means the real beginning of the good roads movement.

The fisheries exhibit, in a building 100 feet long, its two walls built into aquariums, is filled with every kind of fish common to the state. Each compartment is labelled with the correct name of the species within, and the crowds attracted there are evidence of the

EXHIBIT OF SLAUGHTERED MILCH COWS IN DIFFERENT STAGES OF TUBERCULOSIS.

popularity of this special educational feature.

Practical demonstration of the efficiency of the tuberculin test for cattle is given on the grounds, with lectures on the disease, outlining the way it is brought into the herds, showing how it spreads from one infected animal to others of the same herd, and dwelling on the dangers to human life that infection from the milk brings, and the heavy economic loss the disease means to the farmer. Three cows shown by the test to be suffering from tuberculosis are slaughtered and an examination, with very clear explanations made by the State Veterinarian. A demonstration is given of the changes shown as the disease progresses, after the infected organs and glands are dissected, and some of the specimens passed around among the interested farmers present for inspection. One of these cows, apparently the fattest and healthiest of the lot, but showing under the test the greatest infection, had been giving milk to city consumers for over six years. In the first cow killed, an examination of the lymphatic glands shows only a comparatively slight infection, yet under the tuberculin tests applied to the animals, each reacted with equal strength, amply demonstrating that the method of proving the presence of the disease is entirely satisfactory.

Of especial interest to women are the demonstrations in the nursery building, where, for the small payment of ten cents an hour, any tired mother may leave her little one under the efficient care of trained nurses and kindergarten teachers, while she joins the eager throngs of visitors. Lectures are given to the mothers by the head nurse, showing just how the baby's cot should be made, how the little one should be dressed, the proper preparation of milk and other foods, and instructions of just what to do for the child in case of croup, convulsions or any

sudden accident in absence of the doctor. And certainly this nursery is a democratic little household, the elder children playing kindergarten games and singing songs with the younger; while the babies, in their little white cots where the sheets and pillow-cases have just been changed for them, kick and crow and coo in the sunlight and fresh air

SOMETHING FOR "'MOST ANYTHING."
The gasoline engine will pump water, run a cream separator, or grind feed.

pouring in through the wide open windows.

In another part of the grounds, university instructors tell interested listeners about the dissemination of the university extension course, how they are trying to bring the agricultural and mechanical trade courses to those who are unable to attend the university, and just how these courses are taught by correspondence.

A very helpful exhibit is given on the methods of fighting fruit pests. The basis of the exhibit is an actual showing of the effects of various pests on the fruit. Four cases of apples are exhibited, one case showing the havoc wrought by apple curculio, another the results of the ravages of the coddling moth, and a third the disfiguring effects of the apple scab, while the fourth case represents specimens that have been properly sprayed, and the unsprayed apples in the other three cases furnish clear proofs of the merits of spraying all fruit. The methods of spraying are explained and instructions given as to the exact preparation of the Bordeaux mixture, and then the actual mixing is shown, the illustration serving to impress the lesson on all inquirers.

Those interested in the analysis of milk have but to visit the agricultural chemistry department to secure a demonstration of the component parts. Here is shown a quart of milk, and beside it the exact amounts of water, curd, fat, and sugar and ash that go to make it up. Also, in the display of the agricultural college, analysis is made for the benefit of all interested, of wheat, soy beans, oats, and corn, and demonstrations given of commercial fertilizers made from dried blood and tankage, showing clearly and concisely how modern meth-

ods may utilize what was once discarded as waste on the farm.

In the agronomy department display, visitors are taught how to distinguish between what is the best corn and what is inferior, the points governing the judging being illustrated. The value of this work in the last few years is shown in the statistics that prove how one state through the dissemination of pure bred seed corn ranks second in the United States, increasing the average yield over sixty per cent. Illustrations of the results of breeding by selection are shown in wheat, oats, and barley.

Those interested in forestry see a unique collection of the native woods of the state, 81 specimens being shown. Both cross and longitudinal sections are exhibited, and instructions given, as to the care, cultivation, pruning, cutting and the value of these different woods. If the same interest in this line were shown by each state, the heart of our great forests would be preserved to us forever, and desolation and waste by forest fires and indiscriminating lumberman's axe would soon be a thing of the past.

Equally interesting are the collections of mounted birds, in some fairs; each specimen being a native of the state. Its habits, and information as to just how much assistance each one is to the farmer is discussed by competent instructors. Many a farm owner or fruit grower looks upon every bird that steals a cherry or a kernel of corn as a natural enemy, and has no idea of the number of harmful insects and fruit pests this same bird makes away with.

Much of interest may be learned about the great possibilities of the sugar beet industry, when by the sugar beets themselves is placed the finished sugar, and also cane sugar, and visitors invited to distinguish, if possible, between them.

Another interesting lesson is gathered from the display of all the varieties in each state, of wild and tame grasses, showing how to tell them apart and the exact habits and value of each.

Bright with promise for the future and of unusual interest because of the age of the exhibitors, several fairs exhibit special departments of farm and garden produce raised by boys and girls under sixteen years of age, and, in excellence, rivaling the exhibits of the oldest farmers. Mammoth pumpkins, giant squashes, vegetables of all kinds are shown here.

The state fair of today is only a beginning. Its possibilities for future good are practically unlimited. Now, the ranch owner goes to the fair with his family, not only in a spirit of friendly rivalry, to get the value of comparison of his own fine stock and farm produce with that of his neighbor's, but also to learn the latest improvements, the very newest and most up-to-date ideas in his work; so that, at the end of state fair week he will have more respect for all those who are helping to make farming what it should be—the most attractive, the most scientific, the healthiest, the happiest, the grandest profession in the world.

On the "Pike" the "fierce, untamed" lions roar, as always, the "barkers" bark, and the "hot-dogs" sizzle. The sun shines and the crowds make merry, and isn't that what the "Pike" is for?

While the fat pigs seem fatter, and the horses bigger, the cows giving more milk than they used to, one department of the state fair seems just the same—the garden products. Here, in the agricultural building, is the veritable horn of plenty, pile after pile of good things from field and orchard. We inspect the big yellow pumpkins and tender squash, the prize ears of corn and the tempting rosy-cheeked apples just as we always did.

In the quiet of the big place, clustered and bordered with these old friends of our boyhood on the farm, we are out of hearing of the noisy engines and din of machinery, and we think fondly of the days so far gone by, of hoeing corn with the old hand hoe,—how short the rows seemed when the sun was high, but how they lengthened with the shadows! The twilight milking, the old fashioned cellar —its damp fragrance comes to us now—of old Dobbin and the buggy—yes, we could put the old harness on with our eyes shut—remember every patch on it, and the girl we used to take out riding. She's looking at the pumpkins, too, thinking just what we are, you can bet! So we go out into the sunlight and hear the beat of engines again, but we're glad we thought of old Dobbin, and we resolve to come again next year, sure.

THE MOST MODERN FORM OF "OPEN-AIR" COAL STORAGE PLANT.

THE CASE OF THE RAILROADS

By

HENRY M. HYDE

HOW can the railroads continue to pay dividends?

Everything they buy has increased in cost; wages of railroad employes have risen; year after year taxes are greater and local and federal authorities put into effect new regulations which cost increasingly large sums of money.

In the meantime, railroad freight rates on the average have not increased.

How shall the railroad companies continue to pay dividends? How much longer will it be possible to secure capital for railroad improvements and extensions?

The railroad answer to all these inquiries is simple: Raise the freight rates.

Against such an increase of freight rates—which would be felt by every man, woman and child in the United States—there has been a determined protest. The railroads have asked permission from the Interstate Commerce Commission to make the desired increase. Manufacturers and other large shippers of freight have presented evidence to the Commission which is intended to demonstrate that it is possible to still pay dividends without increasing the present freight rates. The case is now in the hands of the Commission for decision.

As attorney for shippers and consumers, Mr. Louis D. Brandeis, declared before the Commission that the railways of the United States could save one million dollars a day by increasing the efficiency of their working force. How is it possible to make such a startling saving?

In the first place it may be worth while to back up Mr. Brandeis by submitting a statement prepared and au-

It Doesn't Pay to Let Other Roads Have the Use of Freight Cars Indefinitely.

thorized by the experts of the United States geological survey.

Fifty-one thousand locomotives were in use last year on the railroads of the United States. During the twelve months they consumed not less than 90,000,000 tons of coal—that is to say, about one-fifth of the total quantity mined in the same period in the United States. They paid for this fuel about $170,500,000.

More than half of this vast amount of coal was wasted. Not far from 9,000,000 tons, or nearly one-tenth of the total quantity, passed out through the smokestacks in the form of unconsumed cinders and sparks. More than 10,000,000 tons escaped in the shape of gases discharged from the stacks, and something like 3,600,000 tons were burned to evaporate the moisture contained in the coal.

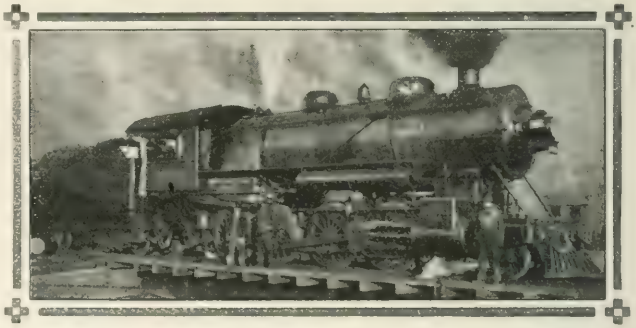
It is further reckoned that 5,000,000 tons were lost through radiation, leakage of steam and water, etc. Another item of nearly 3,000,000 tons represents the waste through unburned fuel in the ash. But the largest single item of loss is involved in starting fires, in moving locomotives to their trains, in backing trains into or out of sidings, in making good safety-valve and leakage losses, and in keeping the engines hot while standing. This amounts to not less than 18,000,000 tons.

When all the losses are subtracted, it is found that not much more than 41,000,000 tons of coal are actually utilized for the running of trains, nearly 50,000,000 tons being thrown away in one way or another.

To descend from a general statement to practical experience, it has been found that in firing a locomotive on a run of 100 miles, a good fireman—he need not be an especially trained expert—can save two tons of coal as compared with the amount used by the average fireman. Such a saving on all the locomotives in the country would amount to more than $100,000 a day.

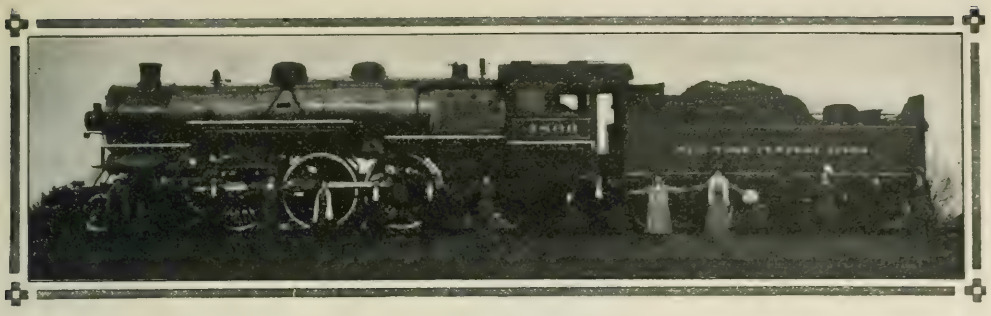
Why have not the shrewd managers of railway corporations already put into practice such a profitable reform?

Railroad managers, admitting in a general way the great and unnecessary loss in the use of coal, plead that it is practically impossible to get firemen who will make the saving. But that plea will not stand. On certain roads it has been already demonstrated that—without any change in the operating force—it is possible to make a tremendous saving.



Big Locomotives with Tremendous Tractive Power Mean More Cars in a Train and Fewer Number of Employes.

When the panic of 1907 struck the country the railroads suffered severely. Among others was the Chicago, St. Paul, Minneapolis and Omaha road, with more than 1,700 miles of track. When in November, 1907, the net earnings of the road showed a loss of $210,000 over the same month in the previous year, A. W. Trenholm, the general manager, decided on a radical step. He sent for representatives of the various



IMPROPER FIRING, ESPECIALLY ON LOCOMOTIVES SUCH AS THIS, MEANS A FORTUNE WASTED ANNUALLY.

unions of railroad employes and asked their aid in saving the dividends for the stockholders and jobs and high wages for the workmen. The union officials promised their fullest co-operation. At their suggestion joint meetings of employes were held at all division points. These meetings were attended by from two to six hundred men, each, including in every case, at least one of the general officers. Every man present was asked to make suggestions as to how savings could be effected in any department of the road. Perfect frankness in making criticisms was invited. As a result the men left these meetings full of determination to do everything in their power.

The first month after the meetings began—with practically no difference in the tonnage hauled—the saving in the coal bill alone was more than $38,000. If a proportionate saving were carried out for one year on all the railroads in the United States it would amount to the great sum of $55,000,000.

There would seem to be no good reason why what was so easily accomplished with an average outfit of firemen on one road should not be carried out generally.

But the saving in coal was by no means the only result of the meetings. At the end of the first month the balance sheet showed a drop of $160,000 in operating expense. A similar saving on all the railroads of the country would aggregate $257,000,000 which is well along towards Mr. Brandeis' figure of one million dollars a day.

As times grew better, after the panic, the united effort to hold down operating expenses continued all along the line of the "Omaha." For the year ending June 30, 1908, the gross earnings of the road had, it is true, dropped $1,134,000. But the operating expenses during the same period decreased, also, to the extent of $1,057,700, so that the net loss to the stockholders was negligible. A comparatively few employes were laid off—but there was no reduction in the wages of the great majority who were kept at work.

The panic served also as a training school for greater efficiency on several other railroads. On the Chicago & Alton, for instance, great efforts were made to get the employes to co-operate with the managers in cutting down operating expenses. Meetings of all available employes were held at division headquarters twice a month, at which every-

SAFE-GUARDS FOR THE PUBLIC, SUCH AS THE BLOCK SYSTEM, SAVE MONEY BY PREVENTING WRECKS

day problems arising in the operation of the road were discussed and suggestions made for improvements. Largely as a result of these meetings the operating cost of the "Alton" for the year ending June 30, 1908, was $431,000 less than during the previous year, thus largely making up the loss in gross earnings for the same period.

Another great and constant cause of loss is preventable accidents. It is declared that of all railroad accidents at least eighty-five per cent. are due to the violation of rules and orders by employes. How is it possible, without changing the personnel, to stop a large part of this terrible destruction of life and property?

To this problem, as old as railroads, Julius Krutschnitt, Director of Maintenance and Operation on all the roads in the great Harriman system, has found at least a partial answer.

One of the greatest evils of the railroad business has always been the way in which railroad officials and employes shift—or endeavor to shift—the responsibility for errors or accidents from one department or one man to another. In case of a wreck, the conductor will blame the engineer; the engineer the right of way department; and so on, until in many cases it has been impossible to dig the truth out of all the confusion. This confusion has been increased and made worse by the historic policy of most railroads of absolutely refusing to make public the facts about accidents occurring on their lines.

More than three years ago, after long and careful study of the situation, Mr. Krutschnitt put into force a plan for fixing the responsibility for accidents and established, at the same time, the policy of giving out, fully and promptly, to the newspapers, all the facts about accidents. Under this arrangement, whenever an accident occurs which results in loss of life or any considerable amount of property, the division superintendent, master mechanic and engineer are required to go at once to the spot and there organize a board of inquiry, composed of themselves and at least two outsiders, who are men of reputation in the community. It is the duty of this board to fix the personal responsibility for the accident. In case they fail, after a second trial to do so, a new board, made up of the general officers of the road, will make an investigation of its own and reach a conclusion, naming the man or men responsible for the disaster. The re-

Where Millions Upon Millions Are Invested in Terminals, It Is Easy Enough for Other Millions to Be Wasted.

ONE LONE STRETCH OF TRACK IN A SYSTEM OF TEN THOUSAND MILES. Where complete superintendence is impossible there must, of course, be much waste.

sult is that on the Harriman roads the responsibility is always fixed.

The reports of these boards of inquiry, put in the form of a brief bulletin and including the names of the guilty parties, are promptly furnished to the local newspapers and also are posted in the division headquarters. As a result of thus putting the blame where it belongs and making the names public it has been found that the employes generally are very much more careful to observe all the rules and orders.

At any rate the new policy has made an astonishing r e d u c t i o n in the number of accidents on the Harriman lines. Men who know that their carelessness will certainly be found out and that they will be named as guilty in case of resulting accidents—pilloried publicly, before the eyes of their o w n f r i e n d s and neighbors—are always on guard.

What is saved by cutting down the number of accidents on a railroad is not a matter which can be accurately figured. But it is certain that the adoption of the Krutschnitt system on all the roads in the United States would result in the saving of millions of dollars.

If railroad managers everywhere would adopt on their own lines all the successful reforms which have been worked out, in piece-meal, on other lines, it is certain that the general efficiency of railroad service would be greatly increased.

Memory

Bliss in possession will not last;
Remembered joys are never past;
At once the fountain, stream and sea,
They were, they are, they yet shall be.

—JAMES MONTGOMERY.

SANITARY SLAUGHTERING PLANT BUILT BY A LITTLE TEXAS TOWN.

CHECKMATING THE MEAT TRUST

By

CARL CROW

YOU know how the prices of meat have jumped around during the past year. Time was when one could, for fifteen cents, secure a piece of ham and an egg, cooked by the most expert of "fly" cooks. Then the price jumped to twenty cents and the impetus carried it up until a hungry gentleman could not satisfy his appetite with these delicacies for less than twenty-five cents. In the meanwhile, the same violent waves were disturbing the menus in the big restaurants upstairs. Planked steaks rose in price so violently that only the idle and careless rich continued to order it without looking first at the latest quotations. Oftentimes during the year Mother Hubbard was not so much disturbed by the fear that she would find no bone in her cupboard as by apprehension over the bill of the butcher from whom she bought the bones.

In the general storm over meat prices, it is pleasant to find one port where all is peaceful and housekeepers throw out the bones to the family dog and wash the breakfast dishes without a dread of the morrow's meat bills to disturb them.

Paris is the name of this blessed place —not Paris, France, nor Paris, Kentucky, but Paris, Texas, a town which boasts of a population of 11,500 and cheap porterhouse steaks all the year round.

At one time Paris was chiefly occupied

with supplying the world with beef. As the center of a big cattle range it was one of the early cow towns of Texas. Then the cattle frontier moved westward and in the rapid development of the Southwest Paris became, instead, the center of a farming country, with a strong leaning toward the production of cotton. In a very few years, the producers of steaks found themselves to be the consumers. It gave them a new point of view of the cattle business. Previously, they had been interested only in the price they could secure for the cattle. Now they became interested in the manner in which their steaks were prepared for market and the price they had to pay for them.

The steaks they had for dinner, they found, came from two sources—from the packing houses or from the local slaughter houses.

The packing house meats were presumably clean and high priced. The slaughter house meats were lower in price and were accepted with confidence by those who had never been around the slaughter houses. Paris people found the only alternative—a municipal abattoir, and that is the reason steaks and pork chops and bacon are cheaper in Paris than in the rival city of Sherman, sixty miles distant, and that much nearer to the nearest big packing house.

Paris had five slaughter houses. The buildings were cheap shacks, never cleaned, from which a disagreeable odor constantly filtered. The butchers were dirty, unkempt negroes whose primitive ideas of sanitation were not improved by their experience in this business. Each of these slaughter houses showed hygienic horrors Upton Sinclair knew nothing of when he wrote "The Jungle." Flies were allowed to swarm in the open doors during the summer time and feast upon the freshly slaughtered meat. Hogs, waiting in the pen, lapped up the blood of their kind which had preceded them to the block. The water which was used to wash down the cows or hogs came from a pool in the hog lot or from a surface well near by. Officials of Paris in describing these conditions now say, with reason, that they believe the same flagrant conditions exist today in hundreds of the smaller cities.

More than two years ago Mayor McCuistion began to call attention to the bad conditions of the slaughter houses. Like most reformers, he preached at first to an indifferent audience.

The little city of Paris paid scant heed to his warnings and apparently was satisfied with the old fashioned way of getting its meat. The butchers continued to haul cows, hogs and calves to the slaughter houses in the same dirty wagons and the same negroes continued to kill.

Deciding finally that he could not awaken public sentiment, Mayor McCuistion called the butchers together and demanded a joint slaughter house, operated under the direction of a competent inspector. Meeting after meeting was held, but petty business jealousies always stood in the way of concerted action. All the time, however, the mayor was working out one idea after another. In this, he was ably assisted by one of the leading meat market proprietors, Hiram Hicks, and the two eventually evolved the abattoir.

MAYOR EDWARD H. MCCUISTION, OF PARIS, TEXAS
He showed his townsmen how [illegible]

Up to this point, the meat consumers of Paris had taken little interest in the warnings of the mayor. The business men and the housewives, knowing nothing of the dirty methods through which the steaks reached them, could see no reason for a change. Established custom is hard to change, whether it be in the matter of meats or morals.

Just as soon, however, as the city council called an election on a $10,000 bond issue to erect an abattoir, Paris people became interested. The name itself sounded strange and sent half of the town to the dictionary or to his neighbor for the meaning. The purpose was still more novel and soon the town was as engrossed with the proposed bond issue as it had been with the prohibition election six months before. The whole town was divided into pro-abattoirs and anti-abattoirs.

Opponents of the idea characterized the scheme as a dream and went so far as to call Mayor McCuistion and his friend socialistic. An abattoir for a city of 200,000 might do, but never for a town of barely 12,000.

Anyway on election day Mayor McCuistion won out and the money was voted for the plant. This opposition, it should be said, has been entirely converted. The butchers say that they get their meat delivered to them cheaper than ever before. The people say the meat is better and just as cheap.

Not only had the mayor and the councilmen won out in their fight but they also developed the abattoir idea until it had expanded and had grown into a miniature municipal packing plant.

The slaughtering of animals naturally brought up a caravan of questions. The undesirable parts had to be disposed of; the smell, gases and odors had to be taken care of and the sewage looked after. But to these emergencies the officials were equal.

Naturally, a refrigerating and storage plant first suggested itself and then a reduction and rendering system. Months of inquiry were necessary before the proper machinery and information were secured, but enthusiasm spurred the workers, and exactly twelve months from the day the idea had been broached, the first municipal abattoir plant in the world was opened.

It was easy enough to select the officials and to apply sanitary rules. The first employee was an inspector, who was familiar with all of the federal government's livestock regulations and quarantine rules. Then a superintendent was employed who had charge of the plant. A foreman of the killing floor and three assistants completed the force.

At the outset, this represented an expenditure of $500 per month in salaries. Insurance, which was very high at first, repairs, etc., brought the maintenance cost per month up to $600.

A tentative price list was finally decided upon. The city agreed to slaughter a beef for one dollar and fifty cents and a hog, sheep, goat or calf for one dollar. This fee included many things. Under the arrangement made then and continued until the present time, the butcher delivers his steer into the stock pens, adjoining the abattoir, and does not see the animal again until the meat is placed on the hook in his market, ready for sale to the public.

Before the steer is allowed to leave the stock pens, the municipal inspector must make a thorough examination. If the steer is diseased, the butcher is ordered to return and take it away. While thorough, this examination on the hoof is superficial, compared to the rigid process through which the meat must go in the killing room. The inspector dons his rubber suit on all butchering days and examines carefully every part of the animal's body.

Five days of cold storage are included in the abattoir fee. The responsibility of the city does not end until the sixth day, when the beef, neatly and sanitarily sacked, is delivered to the owner.

The precautions, which the city takes in handling this meat, are noteworthy. Each negro who works on the killing floor is obliged to put on a freshly steamed white suit daily. The tools are all sterilized. The sacks into which the meat is placed before delivery to the patron must be absolutely fresh.

Despite the small butchering cost, the hide from the beef is not retained by the city, but is returned to the butcher, ready for sale to the wholesale dealer. The

THE SORT OF INSANITARY SLAUGHTER HOUSES ONCE OPERATED IN PARIS.

price of a hide alone will pay for slaughtering a half dozen steers, according to the present market price of green hides.

After thirty days' trial, the city discovered that the butchers were paying too much for the slaughtering, so the fee for a beef was reduced from $1.50 to $1.25; that for the smaller animals from one dollar to seventy-five cents. These prices still prevail. The reduction came unsolicited by the butchers. They freely admit that the city is doing the slaughtering for them cheaper than they themselves could ever do it. The difference is roughly estimated at 25 cents on each animal, and the results are far better. At present the city is serving ten regular customers and all of them are satisfied.

The plant has been more than self-sustaining. Its first year ended November 30, 1910, and the closing of the books revealed a profit. The original investment was $10,000. The cost of operation, including interest on bonds, salaries, repairs, insurance, etc., was approximately $7,500. The receipts were more than $9,000 and would have exceeded $12,000 if the plant had been large enough.

The thrift of Mayor McCuistion and his assistants in allowing nothing to go to waste was largely responsible for the success of the venture the first year. For instance, the horns of the decapitated cow are turned into money. Around the old fashioned slaughter house these details were laughed at. To some youngster, anxious to make a hunter's horn, the cow's head was given. The tails were discarded as useless and thrown into the lot to decay. Paris is showing rare municipal economy by selling the cows' horns and tails. Even the gases from the rendering tank are used in the furnaces as fuel.

Of course the slaughtering charge is foremost among the sources of revenue. Last year 2,206 beeves were killed, which placed more than $3,000 to the credit of the abattoir. Hogs did not bring in as much money because of the smaller charge, but made a good second with 1,833 killed and $1,800 in money. The revenue from calves was $316 and from sheep and goats, $161.

The plant celebrated its first birthday by shipping a car load of fertilizer to Little Rock. This brings the city $20 per ton. The fertilizer comes from the rendering and reduction plant. Not only are all undesirable parts from the killing room thrown into this vat but also all

dead animals for miles around. Railroad officials who have heard of the reduction plant, send in daily dead cattle and horses and turn them over to the city for conversion into fertilizer.

Cleanliness is emphasized as much in the reduction and rendering rooms as in the cold storage departments. The dead animal is cooked in a hermetically sealed pot until the odor is destroyed. The gases are drained into the fire box and burned. The water is turned into a sewer. A dead cow is cooked seven or eight hours but a mule is so tough that sometimes the engineer must remain on duty all night before the parts are dissolved. A horse is the happy medium between the mule and the cow.

Farmers in Lamar county have created a demand for the fertilizer. Last spring they used every ton that could be turned out and came back for more. This spring will probably see a repetition of 1910 and in preparation for the expected rush, the city is storing up an immense supply in a nearby warehouse, where it can be delivered to the farmers as they need it.

When the plant was erected, no provision was made for storing the fertilizer, with the result that one of the first improvements which must be made will be a warehouse. A site has been secured for this building.

INSPECTOR AT WORK IN THE KILLING ROOM.

The butchers, who fought the plant a year ago, and the people themselves who were originally so indifferent about it, have started a concerted movement now for an increase in its capacity. They are so well pleased that they want the abattoir and reduction plants doubled.

Mayor McCuistion and his councilmen have announced that another bond issue will be necessary and the announce-

THE KILLING CREW OF PARIS' SANITARY SLAUGHTER HOUSE.

ment has met with popular favor. It is planned to increase every department and to enlarge the grounds so that the reduction room can be separated from the cold storage and killing departments. In this, the city made its only mistake, according to the officials and experts who have examined the plant.

The reduction and rendering departments should be at least fifty feet away from the butchering room and cold storage vaults for very evident reasons. The only noticeable odor comes from the reduction tank. This is not offensive in the plant at Paris, but it is enough to be objectionable from a scrupulous sanitary standpoint.

In the spring the two departments will be separated. Besides the increase in capacity in all departments the city will also put in big filtering tanks and a huge storeroom.

For the past year only the Paris markets, with a few individuals, have been served at the abattoir, because of the limited capacity. Farmers have been unable to use the abattoir for their stock, but with the additions, it is expected that all in Lamar and surrounding counties can be served.

This will mean the passing of the old fashioned hog killings, which in Texas and in other Southern states must wait on cold weather. The farmer next fall will take his herd to the Paris abattoir, where they will be slaughtered and returned to him for the nominal charge of seventy-five cents per head, which is cheaper and far more satisfactory than the owner could do at home with the assistance of his neighbors. If the weather is warm or if the farmer should prefer it, he can leave the meat at the municipal cold storage plant indefinitely at a cost of ten cents per day.

While the opposition to the abattoir has virtually disappeared in the city of Paris, some farmers who were once privileged to peddle meat on the streets in the old days complain that Mayor McCuistion has built up a monopoly for the local butchers. It is true that only such meat as has been inspected by the city and killed at the city's slaughtering

house can be sold, without violating the law. The farmer who makes his own sausage in the fall and retails it from his wagon in town when cotton picking is over is now liable to arrest and punishment. Neither can he sell any kind of pork products. All of this is prohibited by recent ordinances.

These ordinances were passed to protect the home butchers from an economic injustice. It would be manifestly unfair to force them to comply with the rigid sanitary regulations and then absolve the farmer from them. The ordinances were also adopted as a protection for the public, which might not know that the peddler's meat was uninspected, and carried with it germs which were none the less harmful because they came from the country.

At the outset the city announced that the abattoir and reduction plants were not established as revenue producers. The municipality made it clear that every dollar of profit would be turned back in the way of improvements, with the ultimate hope that the price of meat and meat products would be lowered. This program has been faithfully carried out. The price of killing was reduced within thirty days after the plant started and since then every cent of profit has been expended in various improvements.

Upon this basis rests the theory of the mayor and others in Paris that the construction of these municipal abattoirs will be the means of checkmating the beef trust. This theory, like many others, gradually developed following the construction of the pioneer plant.

Mayor McCuistion estimates that, in the course of a year or so, the abattoir and reduction plants will be so highly developed and improved that the city can then turn its attention to cutting down meat prices in such a way that a hardship will be worked on no one.

For instance, the slaughtering fee will be lowered until it will be nominal. In fact the time may come when beeves will be slaughtered free. Then the butcher will be able to lower the cost of living by selling more cheaply.

The abattoirs, if enough of them are established, would soon become formidable competitors of the packing centers, for each one would supply the local demand, just as the Paris plant has done. Paris once shipped many car loads of cattle annually to the Fort Worth and St. Louis packinghouses and received them back as steaks, on which the consumer paid the freight both ways. The first year's statistics, compiled by City Secretary Wright of Paris show that the abattoir has built a home market and that the shipments to and from the packing centers are becoming smaller.

The killings at the abattoir are increasing remarkably. In January, 1910, one hundred and thirteen beeves were slaughtered. This number marks low tide in the abattoir's operations. In February the killings had increased twenty per cent. The year's record was reached in October when two hundred and ninety-eight beeves were slaughtered.

The butchers report that Paris is using more home grown and home prepared beef now than ever before and are paying no more for it than they paid a year ago, when the market started on its sensational rise. The Paris family of five members can still have enough porterhouse steak for twenty-five cents.

It is the belief of Mayor McCuistion that the construction of 1,000 municipal abattoirs in the United States would reduce meat prices and checkmate the beef trust within six months. He points out that municipal ownership of these slaughtering houses will prevent their absorption by any trust or combination. An abattoir, as experience shows in Paris, can be successfully operated anywhere, for the method is simplicity itself and requires neither great expert knowledge, long experience, nor extraordinary business ability. Six men can operate a plant for a city of 12,000.

Paris has been a pioneer among Texas cities in practicing municipal ownership. Her citizens were among the first to purchase the waterworks system from the individuals who established it. Recently, by referendum vote, the town authorized the purchase of the electric lighting and gas plants, which, when consummated, will give the municipality control of the meat business, and ownership of waterworks, gas and light plants.

Socialists? No! You would be mighty lonesome in Paris unless you are a Democrat.

NEW THEATRE'S NEW STAGE

By

WENDELL PHILLIPS DODGE

HOW often have we stood by, wide-eyed and open-mouthed, at the sight of a big locomotive being turned around on a turn-table platform near the round-house in a railroad yard, feeling a sense of intimacy at being behind the scenes, as it were, in the theatre of the four-tracked drama. And how simply this engine-turning was done.

It is not surprising, then, that with so many railroad men among the directors of The New Theatre, New York, during the building of which were being constructed two of the greatest railroad terminals in the world in New York, that the turn-table idea should be taken into consideration for the stage of this up-to-date playhouse. True, The New Theatre is not the first to have a turn-table stage, there being one or two theatres in Germany with this form of stage. In fact, according to Claude L. Hagen, who invented the device at The New Theatre and who was the technical director at

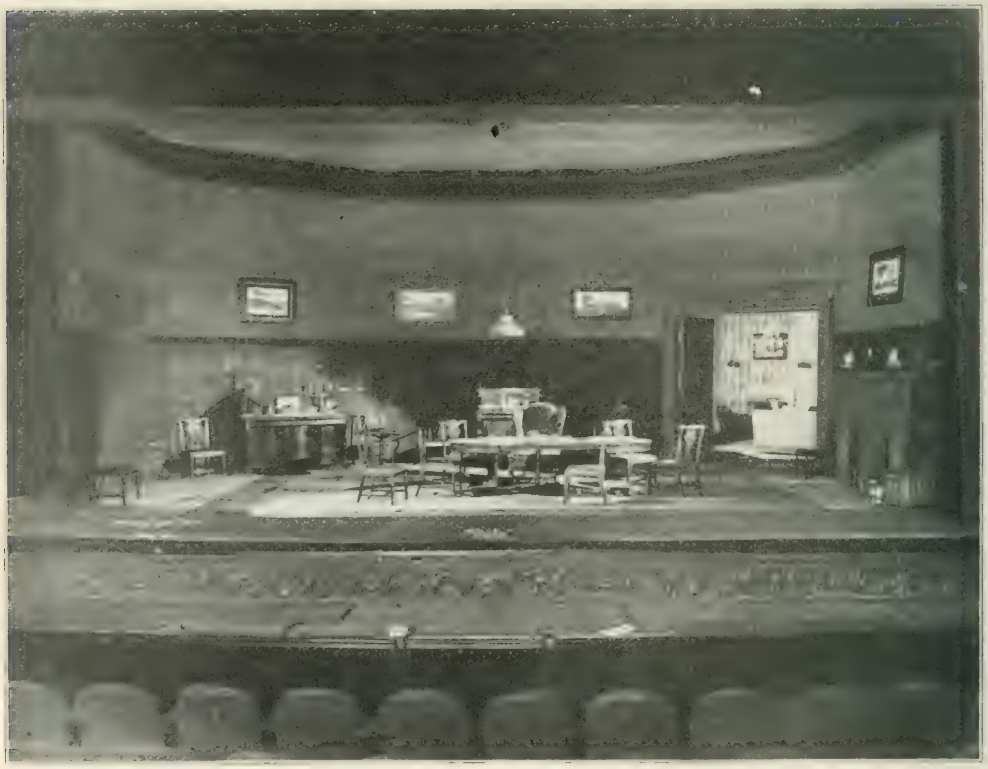
THE MOST MASSIVE SCENE EVER ATTEMPTED ON ANY STAGE FOR A DRAMATIC PRODUCTION
Act II, "STRIFE." Back of this is the setting of Act I. All four acts are set on the turntable before the rise of the curtain on the first act. No stage changes are necessary during the action of the play.

the Central Park West playhouse when it opened, the first revolving stage was in use during the sixteenth century by the Japanese. But, the revolving stage at The New Theatre is probably the most intricate and yet, in its operation, the most simple device of its kind in the world.

When "Strife," the capital and labor play, was produced at The New Theatre a real flat freight car was used in one of the scenes. It was placed on actual railroad tracks and was turned around during the change of scenes on a turn-table considerably larger and of more perfect mechanism than is to be found in any railroad yard in the world! This revolving stage is the most simple device of its kind in existence, although it is sixty-four feet in diameter and weighs 56,000 pounds. There are more than one million pounds of steel in the stage machinery alone and it requires 700 horse power to put it in full operation. The cost of the stage machinery alone was over $250,000.

In the case of "Strife" the four scenes were set complete beforehand, each scene taking up approximately one-quarter of the stage. In "The School for Scandal" six changes of scene were made in six minutes. These scenes were so heavy that they had to be moved on trucks. "Don" and "Liz" were produced with no intermission between them. "Liz," a one-act play, was set complete with the scenes of "Don" on the turn-table stage, and the stage revolved from "Liz" to the first act of the longer play immediately, the intermission taking place between the first and second acts of "Don."

In "Antony and Cleopatra," the initial production at The New Theatre, the palace scene was so large that the stage could not be revolved, but a scene has to be gigantic, indeed, to put the turn-table stage out of commission.



THIS SCENE SHOWS ONE LARGE ROOM AND TO THE RIGHT ANOTHER ROOM. IT WOULD BE IMPOSSIBLE TO PRESENT SUCH A SCENE ON ANY BUT THE TURNTABLE STAGE.
From "Strife," Act I.

One great advantage of having more than one scene set on the stage at one time is that the audience can look through a doorway from one scene to another, thereby giving a more natural and comprehensive view of the setting of the play. In "Strife," for instance, the audience could see beyond the room forming the scene in action into another room in which a meeting of capitalists was being held, the meeting being the subject of conversation in the first room. There is no end to the possibilities for naturalness in presenting a given action on the turn-table stage.

The New Theatre turn-table stage as it will be when completed for next season will be so constructed that any section of it can be raised or lowered, separately or in conjunction with the other sections. In fact, it was so constructed in the beginning, but in its complete form it was not in working order. When completed it will be possible to build a scene on the first seven sections, for example, present it and then lower it into the cellar to a sufficient depth so that the eighth section, on which a scene has been set, may be driven forward sixty feet a minute to the front of the stage. Or, scenes can be set on any number of sections, according to the scene desired, and changed in the same manner.

ARMY'S FINEST MULE TRAIN

By

LILLIAN E. ZEH

THE first modern pack mule train ever to be seen in the East has been recently stationed at the United States Military Academy, at West Point, through the efforts of Colonel Hugh L. Scott, the superintendent. This up-to-date pack train, is just now affording surprising and interesting information as to the value and use of the pack system as a quick and almost indispensable method of transportation over mountains and pathless countries where wagons cannot travel.

The train consists of fifty pack mules, fourteen for riding, one chief packmaster, ten packers, one blacksmith, one cargador, one cook, one bell horse, and fifty aparejos, or Spanish pack saddles. It can keep up with cavalry on the march, and carries food, ammunition, medical supplies, tents, forage, axes, lanterns, buckets, cooking utensils and all the necessary apparatus belonging to a command that intends to move rapidly through the country.

In Indian campaigns the pack train has made fifty miles a day over country without roads. The mules travel loose after "the bell" and can go wherever foot troops can travel.

Down near the Highland Falls end of the West Point grounds the new artillery stables stand, and it is there that the pack train has its quarters. Down there in the corral one finds transplanted a section of Western life in all of its picturesque aspects. The packers wear their cowboy clothes and did not discard their cowboy ways when they left the West.

One of the most interesting figures in the whole "outfit" is Dick the bell horse. Harnessed only with a halter, to which is attached an enormous bell, Dick walks at the head of the train, its undisputed leader. The horse goes wherever he is told and the whole file of trusting mules follow after, their long ears bent forward to catch the sound of the bell. Nor can they be either coaxed or persuaded to linger behind or deviate from the road. While on a practice march it was found necessary to stop two of the rear mules to adjust their loads better. The main pack went on, with Dick swinging his bell, and covered nearly half a mile

COWBOYS PUTTING ON A TWO HUNDRED POUND LOAD.
The mule is blindfolded during the operation, which takes but about two minutes.

in the interval. When the two mules were made ready they took to their heels, at the mad speed of racers, down the road, heedless of the 280 pounds on each of their backs, never stopping until they caught up with the main train.

West Pointers are daily being taught by the plainsmen how to throw ropes, set up and adjust the aparejos, or pack saddles, how to put the baggage in compact and permanent bundles that will not shake loose, and all the other details of adjustment and knot-tying necessary to the arranging of the load. The loading drill of the pack train is gone through with daily. The fifty mules with Dick in the van, take their respective places, forming a head-on line in front of the long row of aparejos. Each animal is numbered, as well as his equipment and blankets. The animals are then taken in pairs near the piled-up loads resting on a raised platform. Each mule is blindfolded during the operation of "throwing the diamond"—that is, the lashing of the load to the pack saddle. Two cowboys swing on the big bundles of baggage, and with mechanical precision some fifty feet of rope is wound rapidly, binding and securing the pack, with only one simple knot at the last.

Each animal is let loose after loading and turned into the courtyard of the stables. Here they wander around and wait until the whole train is made ready. Then, with Chief Packmaster Hollandsworth on Dexter, his prime riding mule, and one of the mounted cowboys leading Dick, at the first tinkling of the bell every mule falls in line, and the pack train moves off.

When Lord Kitchener recently visited West Point, Colonel Scott took him to the corral. In order to show him the clean-cut system developed in the United States Army for handling baggage, he gave the order to the chief packer to load the train for a march.

In just fourteen minutes after the order had been given 13,000 pounds of ammunition and supplies had been packed on fifty mules, and the train was ready to start. Lord Kitchener declared it to be the most rapid and best drilled transportation manoeuver he had ever seen.

This particular group of animals saw actual service in Cuba during the second

THE PACK TRAIN OF FIFTY ANIMALS WITH THEIR 1300 POUNDS.

intervention, and although they are now at West Point for purposes of practice, they are kept in a state of the highest efficiency in order to be ready for use in Alaska, on the plains or hurried to the Pacific coast, in the event of the breaking out of that much discussed war with the little yellow fellows across the seas. For even in these days of modern improvements, an army on the march, es-

READY TO THROW ON THE PACK SADDLES.

THE PACK TRAIN ON THE MARCH.
Out for a day and night's camp, for instruction of the West Point Cadets.

pecially in unimproved or mountainous country, has to leave the transportation of all its food and baggage to the faithful brigade of nimble mules which files after it.

The English, in their last war with the Boers, recognized the value of our mules, and Missouri did a thriving business in shipping to South Africa whole cargoes of the long-eared quadrupeds.

Whether or not our Secretary of War is right when he reports that our army is in no condition to repulse an invading host, or to take the field, this much is certain: If every man in the regular army and every able-bodied male in private life were as willing to perform his duty to his country as are these so-called stupid mules of the service, a war with Japan would not loom up as a dire calamity and the croaking prophets would have less excuse to regale themselves and bore others with their own foreboding words.

STARVING THE DOGS OF TURKEY

By

ARTHUR JOHNSON

THE dog, says the Turk, was created from the saliva of the Devil and from human flesh, and we therefore found under the old regime the Turk living in the street among his dogs, according them a dual recognition. In their fidelity, their courage, and ardent affection for man the Turk sees their human origin; in their mad anger and greed he sees their father, the Devil. He accords them a two-fold treatment likewise. He will put a bandage on a wounded cur, he will let a dog share his meal, he never disturbs the dog that lies sleeping, with Oriental fatalism, across the most crowded thoroughfare—but he never allows a dog to enter his house. That is his sanctuary, and the dog is unclean. This was the Turk's creed before the merciless order came for the banishment of the dogs to the Isle of Oxia, and today it is his creed although the whole world has rung with the horrors of these exiled dogs on the lonely island of death.

The Turkish dog which has recently been banished from Constantinople, and the hordes of which have almost entirely disappeared from the Isle of Oxia somewhat resembled the common European wolf in color and size, and had a marked

IN THE GOOD OLD DAYS—DOGS ASLEEP ON A CONSTANTINOPLE WHARF.

likeness to the English sheep dog, but owing to its nomadic existence is far more powerful and wild. The free life which these animals led in the open streets of Constantinople under the old regime made them independent of man, and the older dogs were entirely fearless of any interference at the hands of their protectors.

How the Dogs Are Caught in the Streets.

The dogs had an entire county of their own, with clans and class divisions, which were strictly enforced by the leaders of the different tribes. These scavenger dogs, of course, were an entirely necessary evil under the old regime, and opinions differ as to whether they are not now vitally necessary in Constantinople where their use as scavengers was a recognized force. Without their dogs Turkish towns would disappear beneath mountains of refuse, and although the dogs themselves were often ridden with disease, yet it is certain that they performed a duty, which, in the absence of any other sanitary arrangement, was a vitally necessary one for the health of the inhabitants of Constantinople and other large Turkish towns.

The dog world of Constantinople had its wars and its times of truce, and its canine life was recognized by an instinctive social year. Every street, or part of a street, in the capital had its own dogs to whom the refuse of that

A Cargo of New Comers Just Landed on the Isle of Oxia.

STARVATION—A SCENE OF HORROR ON THE ISLE OF OXIA.

particular quarter belonged absolutely. Never did one clan ravage the hunting ground of another family, and in spite of what may have been written to the contrary, the dogs preserved order like a well-drilled army.

Among the female population of dogs it was a common sight to witness the reception of a male member of the tribe who had taken refuge when sick or wounded in a street fight. The female contingency performed their maternal duties in the open street which was both their playground and battle ground for life. Pious Moslems used to feed the mothers on rice and other delicacies in order that their progeny might be strong and healthy and a credit to their district. Although the scavenger dog was a mere chattel of the Turkish householder, he was nevertheless a chattel which was recognized as having a use, and which, in the absence of better conditions, could not be surpassed in the work of offal monger.

When the old order was changed it was decided, whether rightly or wrongly, to banish, practically speaking, every dog from Turkey, and certain it is that when the edict went forth Constantinople witnessed some remarkable sights. At the time these unfortunate four-footed friends of man were being hastily shipped to the deserted Isle of Oxia in the sea of Marmora, the dogs were roughly secured, and daily transported to Oxia in the rough ves-

PITCHING DOGS INTO THE CART THAT IS TO TAKE THEM TO THE VESSEL.

SCAVENGER DOGS OUTSIDE OF CONSTANTINOPLE.

by the unaccustomed solitude, and famishing with thirst and hunger at last turned upon the weaker of their brethren, and probably for the first time in their lives eked out their existence by living on the flesh of their fellows. The bodies of dead and dying dogs were seized upon with avidity by the vast living hordes of quadrupeds, and scenes revolting in their savage cruelty were witnessed daily on the Island of Oxia.

Although the Turkish government, as we have previously mentioned, supplied quantities of food in the way of bread, etc., the supplies were altogether insufficient to keep life in this vast horde of scavengers, and slowly but surely their numbers decreased until the death rate became as high as two hundred a day.

Today the island stands deserted and desolate with here and there a lonely pariah - like beast who wanders slowly over the bones of his fellows waiting for a welcome death to remove forever from his sight the horrors of his graveyard home.

sels which are seen in our photographs. On arrival these dogs were turned loose and left to forage for themselves. Many thousands of dogs were thus landed, and at least in the early days of their forced retirement they were left entirely without food, and it seemed a prearranged plan that they should be allowed to die of thirst and hunger. Public opinion, however, was brought to bear, and the Turkish government after a time provided the dogs with food and water.

Heart rending scenes of misery and desolation met the eyes of those travelers who paid a visit to the island during the time the dogs were in existence: dead and dying animals were to be seen everywhere, and in fact the banks of the island adjacent to the landing places represented a huge charnel-house. Thousands of dogs driven desperate

ENORMOUS "GRIPPERS" WERE USED TO CATCH AND THROW THE DOGS.

Casting a dog out of a ship upon the shore of the Isle of Oxia.

TO FILL THE CHURCHES

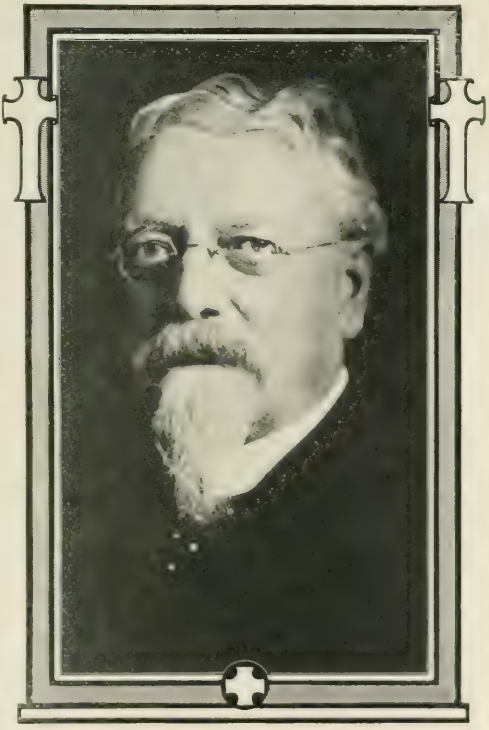
By

H. H. BRINSMADE

A FEW days since, with little or no blare of trumpets, there was quietly observed in Rochester, N. Y., the dedication of an altogether new idea in church work, which in the opinion of many, is bound to spread all over the country, solving to a large degree the perplexing problem of how to reach the great mass of people who are slowly but surely drifting from the sphere of church influence owing to our complex, ever-expansive civilization. Just how to meet this problem and "modernize" the church to meet twentieth century demands, is a question of ever increasing moment. Blazing the way by a highly ingenious, original, and thoroughly wholesome and helpful plan of enlarged activity, Brick church, Rochester, believes it has met the problem of empty pews and lethargic, luke-warm performance of church duties. As a monument to unusual foresight Brick Church Institute was dedicated.

The institute, which cost complete $150,000, is located beside Brick church. It is an attractive structure comprising four stories and basement, and has a frontage of sixty feet and a depth of one hundred and fifty-nine feet. While the structure, all of brick, on the exterior looks rigidly plain and not dissimilar to an ordinary commercial house, the interior possesses an air of good taste and even elegance in its appointments.

The front lobby resembles that of a well-constituted hostelry with a terraza floor, imposing columns and general air of elegance. At one side is a safe for lodgers' valuables, a mail case, announcement bulletin, key case, check room, switch board controlling the lighting system and all the other appointments of an up-to-date hotel. Facing the rear in the lobby is also a ladies' room and parlor. A spacious kitchen and inviting dining room seating nearly one hundred and fifty are also on the first floor. Every known culinary contrivance is provided to such a degree as to make many a hotel owner look with envious eye.



H. A. Strong, of Rochester, N. Y., Whose Generosity Made Possible Brick Church Institute.

Down one flight is located an admirable gymnasium, equipped with, among other things, a cork track. Steel lockers for men to the number of one hundred and fifty-six are furnished. In an adjoining room is the swimming pool forty feet long and of a graduated depth ranging from three

BRICK CHURCH AND INSTITUTE, ROCHESTER, N. Y.
The church building is at the right.

and a half to seven feet. Marble shower baths are also near by. In the next room are lockers for women to the number of fifty-two, and certain hours daily are set apart for women who have access to the gymnasium and swimming pool. Boys have lockers, to the number of one hundred and ten, all to themselves.

On the left of the basement are four excellent bowling alleys. For the lovers of pool and billiards provision is made by the installation of three pool and one billiard table. The cost of these games is made just half the charge elsewhere, as tickets are sold at a cut rate.

Across the entire front of the first floor are smoking, lounging and reading rooms for men. The decorations are in a pleasing mission style and an attractive fireplace and an abundance of magazines and newspapers give a home-like air.

In the rear of the first floor is an assembly hall which seats three hundred persons. The stage is equipped with drop curtain, scenery and all that goes to comprise a well constituted stage of fairly average capacity. On this stage will take place dramatic performances by the amateurs of the church. Near by is a room for boys and a circulating library room. The housekeeper is well provided for with a five room flat.

On the second floor, also, are located the class rooms, for the educational end is one of the leading aims of the new work. In these class rooms will be taught millinery, shirt-waist making, basketry, woodwork and all manual training arts. Any one is welcome to join these classes and the fee is only one dollar to be paid for membership.

The entire upper floors are given up to rooms of which there are eighty-two. Lodging costs by the week from two dollars to four dollars and thirty cents a week. No finer appointments are furnished in any of Rochester's hotels. Telephones, shower baths and in fact all

conveniences are furnished on each floor.

To insure the safety of the inmates, an elaborate fire alarm system is employed. As soon as the temperature reaches one hundred and forty-two degrees Fahrenheit, a wire fuses and an alarm is automatically sent in to the office.

Brick Church Institute owes its existence to the generosity of its founder and chief contributor, Henry Alvah Strong, to Rev. William R. Taylor, the energetic pastor of the church, and to the faithful of the congregation who, after the building funds had been furnished by Mr. Strong, themselves provided the amount requisite for its equipment and furnishing.

Just what are the causes leading up to this departure in church activity are perhaps best told in the words of the Rev. V. V. Raymond, of New York, who spoke at the dedication. Speaking of "The Relation of the Church to the People," he declared that fully two-thirds of the people are out of touch with the church and that the fact that a large part of these are among the working class is significant. "This alienation," he declared, "is not altogether due to the church, but to social and economic changes. The church unfortunately has heretofore been unable to keep abreast of these changes. In the past, spiritual ministry, the ministry to the soul, has been regarded as all important. All other ministry has been held of only relative importance. The reorganization going on in the church is concerned with the realization that ministry to human needs is just as important.

"The church itself needs a varied ministry. The church people themselves have been losing interest in the church. What they need is not more religion pumped into them, but a service that will appeal to the real heroic instinct. Such an appeal does the Brick Church Institute offer, and as such does it meet in a most hopeful way our modern problem."

For a' That, and a' That

Is there, for honest poverty,
That hangs his head, and a' that;
The coward-slave, we pass him by,
We dare be poor, for a' that;
For a' that, and a' that,
Our toil's obscure, and a' that,
The rank is but the guinea's stamp,
The man's the gowd for a' that.

—Robert Burns

MATING PLANTS WITH WATER

By

RICHARD BENTON

THE discovery, by an expert of the government plant bureau, of a new method of plant-breeding has already brought about some remarkable experimental results, and seems destined to put many millions of dollars annually into the pockets of American farmers and fruit-growers.

This invention, surprisingly simple, entirely removes the difficulty which has hitherto prevented the crossing of many kinds of plants, both ornamental and economic—plants that have flowers so small and organs so delicate that they cannot be subjected to surgical manipulation. Indeed, most of the plant-breeding work accomplished up to the present time has represented the solution of comparatively easy problems, the more difficulty ones being passed by.

Take for example the case of alfalfa, which has long defied the efforts of breeders, owing to the smallness of its flowers and the fragility of the sex organs therein contained. Crude attempts at cross-pollination have been made by thrusting a sharpened splint of wood, previously dusted with pollen, into the "keel" of the blossom, in imitation of the proboscis of a bee; but these have not been attended with satisfactory results. Another method consists in planting one or more plants of a known variety in the midst of a large field of another variety. These plants are used a seed-bearers, and the work of pollination is hopefully left to insects.

Now, the alfalfa flower resembles a sweet-pea blossom in miniature. Examining it in detail, one finds that it is composed of a "banner," two "wings" on either side of the banner, and a "keel" directly opposite the latter. It is the keel that contains the reproductive part of the flower. Do but touch it with the point of a pin, and instantly there jumps out, like a jack-in-the-box, a slender greenish rod, the end of which, striking with much force against the banner, scatters over it a quantity of pollen grains.

"DEFLORATING" LETTUCE FLOWERS WITH WATER FROM A GARDEN HOSE

In a field of alfalfa, a bee comes along, and, thrusting her proboscis into the keel, "trips" it. Out jumps the little rod, striking the insect on her thorax, and sprinkling pollen plentifully over the under part of her body. Thereupon she goes to another blossom, a few feet

away perhaps, and the performance is repeated. But this time the impact of the rod upon her chest causes the pollen she has brought with her to be rubbed into the receptive stigma, which has been concealed within the end of the rod, surrounded by the pollen-bearing anthers. By such chance means are matings of alfalfa flowers secured.

If such chance is to be replaced by the certainty of mating two desirable varieties, it is necessary, in the first place, that the plants shall be grown under glass and protected against insects, which might otherwise bring pollen that was not desired. Next, the flowers must be subjected to operative treatment, the initial step requisite being that all of the pollen shall be removed from the blossom that is intended to serve as the seed-bearer. If this were not done, it would be likely to pollinate itself, and thus defeat the plans of the breeder. When so much has been accomplished, it is a comparatively simple matter to apply pollen from a flower of the desired variety.

The theory is simple enough, but the plant-breeders have not been able to apply it successfully in practice, because an attempt to get rid of the pollen almost inevitably resulted in the destruction of the reproductive parts of the flower. The new method, devised by Mr. George W. Oliver, however, is as effective as it is easy, and has solved the problem perfectly. It consists merely in the use of

ALFALFA FLOWERS—MUCH ENLARGED—SHOWING HOW STRONG A GRIP THE "TRIPPED" RODS TAKE ON PINS PLACED BEHIND THEM.

COWPEA—TO ILLUSTRATE POLLINATION BY THE ORDINARY METHOD.

A—Flower-bud before opening of flower. B—Envelope of flower opened by surgical process to give access to the stamens and remove them. C—Flower with stamens removed. D—Same flower, artificially pollinated. E—Young pod, second morning, showing that fertilization has been accomplished. F—Same pod, one day later.

a tiny jet of water, which accomplishes the purpose with almost magical quickness. The flower to be employed as the seed-bearer is "tripped" by snipping its keel gently with a pair of delicate forceps—whereupon, of course, the little rod, jumping out, would bang its head against the banner, scattering its pollen, were it not that this is prevented by a pin which the operator, preliminarily, has thrust crosswise between the banner and the keel. By this means the rod, on emerging from the keel, is held fixed until the pollen can be removed from it by directing upon it a jet of water.

The instrument used for the purpose is a rubber bulb filled with water such as is commonly utilized by dentists and it serves the purpose admirably. The jet is very small, and the force of it is regulated by the pressure of the hand. When thus employed, it will remove every particle of pollen from the end of the rod in a few seconds.

The next thing requisite is to get rid of the water by applying small pieces of blotting-paper edgewise to the blossom, so as to soak up any drops which might otherwise interfere with the subsequent operation. When this has been done, if

the rod be examined under a powerful magnifying glass, there will be seen, in the middle of its end, a tiny green spot. This is the stigma which is now ready to be fertilized by gently rubbing into it some pollen of the sort that is wanted. Some of the pollen grains will adhere to the stigma, and, sending down minute tubes to the ovary at the bottom of the rod, will impregnate the cells, representing future seeds therein contained.

Here, then, is the whole philosophy of the performance. The fertilizing of the stigma may be accomplished by rubbing it with the pollen-bearing rod from a flower of the desired variety, or, if preferred, the pollen may be applied with a camel's-hair brush which has previously been dipped into a dilute syrup of sugar and water, to make it slightly sticky. Such, in brief, is the process by which, thanks to Mr. Oliver's discovery, any two varieties of alfalfa may be mated.

At the suggestion of Dr. B. T. Galloway, chief of the plant bureau, and in accordance with plans outlined by him, Mr. Oliver, in 1903, began a series of experiments in plant-breeding along new lines. He undertook to cross certain varieties of forcing lettuce—a problem

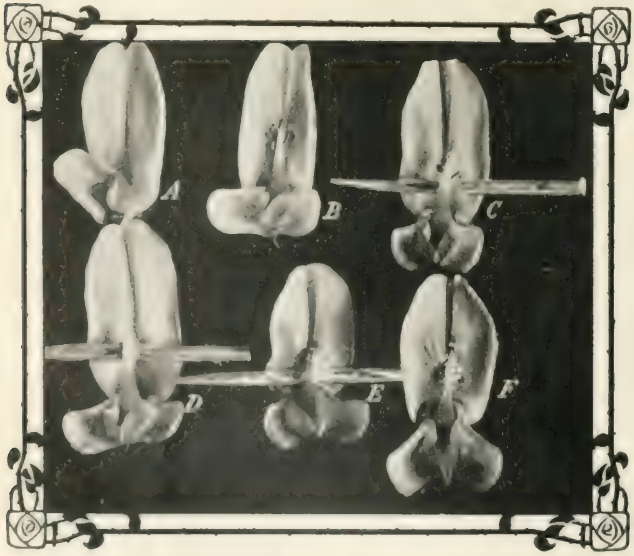
Water Bulbs for Removing Pollen—"Depollinating"—from Flowers.

of utmost difficulty, inasmuch as the flower heads are so small, and the individual "florets" so fragile, as scarcely to bear handling. In truth, the lettuce flower seemed to represent about the limit of difficulty in work of the kind.

After trying various methods without success, Mr. Oliver used a water-jet method similar to that described, choosing for his experiment the "Grand Rapids" variety of lettuce and using pollen from a flower of the "Golden Queen" variety. As a result, seeds matured and all the seedlings grown from them proved to be intermediate between the two parents—true crosses.

The discovery having thus been made, certain minor modifications of the process were afterwards adopted. So simple is the operation that anybody can perform it successfully with a small amount of practice, and it renders the cross-breeding of certain plants hitherto deemed most difficult as easy as that of the rose, the poppy, the carnation, or tobacco.

Not long ago a number of plants of wild pansies



Alfalfa Flowers—Showing Method of "Tripping with a Pin to Secure the Desired Pollination.

A—Untripped flower. B—Tripped and unpollinated flower. C—Rod "tripped" against a pin. D—After washing off the pollen with water. E—The stigma pollinated from flower of a different variety. F—The pin removed.

were found growing luxuriantly in southern California, in very hot and dry places. The idea suggested itself that they might be of use in imparting heat-resisting power to cultivated pansies. Accordingly, seeds were gathered, plants were raised from them, and pollen from a cultivated strain was applied to their stigmas—the latter being first cleared of pollen by means of the water jet. This experiment is still in progress, under the direction of Mr. Oliver, who expects it to prove highly successful.

The Twentieth Century dahlia—a very fine variety—has been similarly crossed with a new species from Mexico, with small bright-red flowers and remarkably long stems. All of the resulting seedlings have the long stems, and in other respects are intermediate between the two parents. By the same means the artificial pollination of clover blossoms has been accomplished—an almost impossible feat by any method hitherto understood, owing to the minute and delicate structure of the individual florets composing each head. With the help of the water jet, however, they are easier to deal with than alfalfa.

Mr. Oliver has found that it is possible to do the same sort of work without the aid of a water jet, by using compressed air instead. An air jet, from a small cylinder into which air has been pumped to a pressure of twenty pounds, serves perfectly well to remove the pollen from the most delicate flowers—whereupon the stigmas are fertilized by the process already described. It is merely a variation of the same method.

THIS TYPE OF ROSE IS EASY TO CROSS WITH OTHER VARIETIES.
This is done by removing the stamens and applying pollen to the stigmas.

The possibilities of this new discovery for future plant-breeding work are obviously vast. It is likely, indeed, to lead to most important improvements in many economic plants, and to the consequent augmentation of crops—a prospect of utmost interest to everybody at any time.

Joy

Joy is the sweet voice, joy the luminous cloud,
We in ourselves rejoice!
And thence flows all that charms or ear or sight,
All melodies the echoes of that voice,
All colors a suffusion from that light.

—COLERIDGE.

SHEEP THAT HAVE TRIPLETS

By J.W. Mitchell

SHEEP that never have less than triplets, that will clip well for fleece and will mature early enough to allow the breeder to sell "spring lamb" at Christmas is the attractive proposition that the United States Department of Agriculture is holding out to the farmers. The Department is always trying to produce something new and useful in the farm line and this new breed of sheep is one of the latest things with which it is experimenting. The herd from which the improved variety of sheep is being produced is now at the Agricultural department Experiment Station at Bethesda, Maryland.

The sheep which form the foundation of the herd look as little like sheep as it is possible to imagine. They look in fact a great deal more like goats and have been mistaken for goats by some expert goat breeders visiting the station. They are reddish in color above, black underneath, are as wild as deer and have no fleece but short red hair very much in texture like a goat's hide. The breed came originally from England but passed through two transitions before arriving in the United States. A great many years ago these sheep were exported from England to the west coast of Africa and there they are supposed to have developed their peculiar characteristics, although very little is known of their original stock or their history in Africa. A good many years ago some were exported from Africa to the Barbadoes and there they preserved the characteristics which either were original with them or which they had developed during their long term of residence in Africa. About three years ago some of them were brought to the United States and since that time experiments have been made in crossing them with breeds of mutton and fleece producing sheep in an effort to preserve the desirable characteristics of the Barbadoes sheep and at the same time make them more valuable for American consumption A feature of this strange breed is that it is very prolific and that the lambs mature very early. The sheep seldom have less than triplets at birth and often they have four and sometimes five. In fact some of the ewes have so many lambs at a birth that they are not able to supply them with sufficient milk and the youngsters die off in consequence. It is thought, however, that many of these can be saved by artificial feeding and that it will be commercially worth while to go to this additional trouble and expense.

Of course the goat-like sheep are no good as they stand either for fleece or

mutton, but crosses have been made that are satisfactory in both of these respects. Some of the sheep have been crossed with the Merino and produce a very good fleece. It will readily be seen that if marketable fleece producing sheep can be made to multiply at the rate of the Barbadoes breed that they will be a boon to the farmers and possibly may even reduce the price of woolen garments.

The Barbadoes sheep have been crossed also with the Shropshire for mutton and while the first generation did not produce an entirely satisfactory market sheep it had enough of the characteristics of its sire to give a fair prospect of making a good leg of mutton in a generation or two and one that would mature by December.

As has been said the Barbadoes sheep are exceedingly wild. They are more like jungle animals than the quiet, easy-going sheep one is used to in this country and when it comes to clearing out underbrush they are more efficient than either American goats or a man with a grubbing hoe. A herd will go through an overgrown strip of woodland, browsing on the saplings and brush in preference to grass, and will leave the tract looking almost like a park. The only difficulty is that they have to be moved when they have done their initial work because they are fully capable of girdling big trees, and will do it if other browsing fodder is wanting.

In spite of the fact that these sheep have been bred in the Tropics for so many years they stand the Northern winters remarkably well. It has been noted however that after a few generations in the North they actually begin to grow a thicker coat on their own account and while they never would produce a marketable fleece without being bred to a wool sheep for that purpose, they seem to have the latent capacity for protecting themselves against the change of climate. Of course with the breeding for fleece and for mutton the tendency of the Barbadoes sheep is to drop their valuable characteristics of fecundity and early maturing. At the same time enough has been learned of the tricks of heredity and breeding for the Department to be able to retain a very large proportion of their desirable characteristics while weeding out the natural objections to this strange breed.

LABOR UNION'S COSTLY BUILDING

By

W. FRANK McCLURE

THE Brotherhood of Locomotive Engineers has recently completed an unusual enterprise at Cleveland, Ohio. It is a thirteen story office building costing about a million dollars, erected wholly as an investment rather than as national headquarters. Every member of the Brotherhood of Locomotive Engineers has an equal interest. It is claimed to be the only building erected on this plan by a labor organization in the world.

Five thousand members of the Brotherhood of Locomotive Engineers from all parts of the United States and from Canada and Mexico witnessed the dedication of this notable building on that occasion last year. The event came at the same time as an international convention in Detroit and a holiday was declared, so that all who desired might have the opportunity to come to Cleveland. Large numbers came both by boat and by train. The dedication exercises were held in Central Armory, Cleveland's largest building, but all who came visited the new building which is declared to be one of the finest in all the Middle West.

The erection of such a building was authorized by action of the delegates at the Columbus convention in June, 1908, on a resolution introduced by John H. Welsh of Atlanta, Ga., and Z. B. Mansfield of Shawnee, Oklahoma. The new building was completed about on schedule time. All the work was done by union labor and each contractor having to do any part of the work was required to insure all workmen against accident. The building was erected without a single assessment on the membership, all needed money being on hand.

This imposing monument to organized labor occupies a site in the main business section of Cleveland but a half block from the public square and close to the new court house, the post office and the city hall. It stands upon a corner and occupies one hundred and seventy-eight feet on one street and one hundred and twenty-four feet on another. The exterior finish of the first story is of beautiful granite and the remaining twelve stories of white terra cotta. The interior is in mahogany and white Italian marble. The walls are in tints, the doors and window trimmings bronze.

Much the greater part of the building is given up to office rooms, the ground floor, however, having an auditorium with a seating capacity of fourteen hundred. Aside from this auditorium, the floor space comprises 161,000 square feet. In all there are four hundred offices. Some idea of the modern facilities installed may be gained from the fact that a vacuum cleaning system is piped from the basement to all the floors to say nothing of the power fans for ventilation and the steam heat under thermostatic control.

The auditorium is equipped with leather covered seats of an especially comfortable pattern. There is a large stage and also a pipe organ which is said to be one of the best between New York and Chicago. Like the office rooms, this auditorium is for rent. The whole building is a business proposition, as heretofore stated, an investment for money which the organization had on hand.

The offices and headquarters of the international organization will occupy the greater part of the eleventh floor. These offices are at present located in Cleveland and, in moving into the new building, they will be but one block removed from their former home. The Grand Chief Engineer who is in charge of the

international organization of Brotherhood of Locomotive Engineers and whose headquarters are here, is Warren S. Stone, who has also had much to do with the carrying out of the unique project represented in this great building.

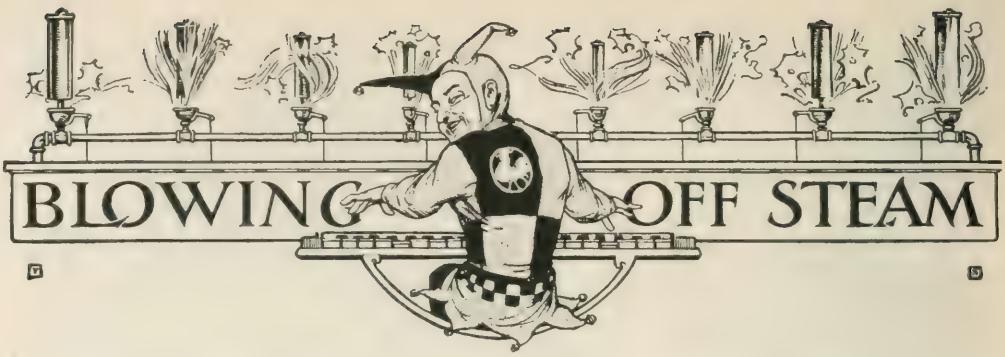
Ninety-five per cent. of all the locomotive engineers in the United States, Canada, Mexico and Panama are members of the B. of L. E. The latest figures place the total membership at sixty-six thousand, representing in all nearly eight hundred sub-divisions.

Detroit, on the border line between two nations, is the birthplace of this organization which, by the way, was the first labor organization in railroad circles. The first meeting dates back to May, 1863, when twelve engineers formed the first division. Later in the same year, delegates from ten divisions organized the Grand National Division of the Brotherhood of the Footboard. At a meeting the following year this name was changed to the present one. Two years later, the monthly journal of the order was launched and still a year later, the insurance association feature was introduced. In 1887, the auxiliary composed of the wives of the members had its beginning and now numbers nearly twenty thousand members.

THE MILLION DOLLAR BUILDING OF A LABOR UNION.
Erected by the Brotherhood of Locomotive Engineers, at Cleveland, Ohio.

Not only does the insurance association of the order provide for the heirs of deceased members but in the event of loss of hand, arm, leg or eyesight the members themselves receive the full amount of their policies. More than twenty-one million dollars have been paid out by this association. Besides, at each of its conventions the Brotherhood of Locomotive Engineers disburses from thirty-five to forty thousand dollars among the widows, orphans and other needy of the order. The members also contribute to an annual disbursement of some sixty thousand dollars a year for indigent and totally disabled members.

The Brotherhood of Locomotive Engineers has contracts with a hundred and seventy-two railroads, embodying rates of pay, rules governing overtime and numerous other conditions and matters having to do with the treatment, suspension or discharge of employes.



On a Bear Market

"Did Mrs. Brown take her husband's failure in the right spirit?"

"Oh, yes. Just as soon as she knew he was going to fail she went out and bought her entire winter outfit."—*Cleveland Plain Dealer.*

At the Door

"Yes, my mind is made up. Tonight I shall ask her to be my wife. B-b-by Jove, I h-hope she's out!"—*Woman's Home Companion.*

A Pittsburg Observation

"What shall we say of Senator Smugg?"

"Just say he was always faithful to his trust."

"And shall we mention the name of the trust?"—*Pittsburg Observer.*

What Did They Know?

Archbishop Ryan was visiting a small parish in a mining district one day for the purpose of administering confirmation, and asked one nervous little girl what matrimony is.

"It is a state of terrible torment which those who enter are compelled to undergo for a time to prepare them for a brighter and better world," she said.

"No, no," remonstrated her rector; "that isn't matrimony: that's the definition of purgatory."

"Let her alone," said the Archbishop; "maybe she is right. What do you and I know about it?"—*Ladies' Home Journal.*

Specious Logic

"Why do you consider women superior to men in intelligence?"

"A bald-headed man buys hair restorer by the quart, doesn't he?"

"Er-yes."

"Well, a woman doesn't waste time on hair restorer; she buys hair."—*San Jose Palladium.*

An Apt Description

"Ever see a mermaid, Jim?" asked Dusty Rhodes, as he threw himself down on the sands alongside of a brother hobo.

"Yaas," said Jim.

"What did she look like?" asked Dusty.

"Oh, I d'no'—rather like a lady cut decollety, with a hobble-skirt around her propeller," said Jim.—*Harper's Weekly.*

A Linguistic Look

"Can you talk Swedish?" they asked Adam Bede when he went to a small town in northern Minnesota to make a speech.

"No," replied Adam; "but I can look it."—*Saturday Evening Post.*

A Fare Guess

Flub—"Who originated the idea that the longest way round was the shortest way home?"

Dub—"Some taxicab driver, I suppose."

An Idea!

Baron (to creditors)—"I see no hopes of being able to pay what I owe you. Why not organize a suicide club?"—*Meggendorfer Blaetter.*

Teaching a Girl to Swim

"Say, Harry, w'at's the best way to teach a girl how to swim?"

"Dat's a cinch. First off you puts yer left arm under her waist and you gently takes her left hand——"

"Come off; she's me sister."

"Aw, push her off de dock."—*Cosmopolitan.*

Rightly Affiliated

"To what denomination does your father belong, little boy?"

"I think it's the brewers' union."—*Life.*

The One Defect

"An heirloom," explained the farmer's wife to her thirteen-year-old boy, "is something that has been handed down from father to son,

and in some instances is greatly prized."

"I'd prize these heirlooms I'm wearing," remarked the youngster, "a good deal more if they wasn't so long in the legs."—*Everybody's.*

English Wisdom

Commenting on the statement that "Bryan doesn't care whether school keeps or not" a London paper expresses surprise that even a political defeat should render such an intelligent man indifferent to the progress of education in his country.—*Pittsburg Gazette-Times.*

Sport

"Well, Bill," said Dawson, as he met Holloway on the Avenue, "did you get any good hunting up in Maine?"

"Fine," said Holloway.

"How did that new dog Wilkins gave you work?" asked Dawson.

"Splendid," said Holloway. "Fact is, if it hadn't been for him we wouldn't have had any hunting at all. He ran away at the first shot, and we spent four days looking for him."—*Harper's Weekly.*

The Sailor Bold

"Now, Captain, you must sometimes get homesick."

"No, really. I'm never at home long enough."—*Sydney (N. S. W.) Bulletin.*

Future Gains for Present Needs

"I shouldn't mind having my contributions paid for on publication, were it not——"

"What?"

"That my meals have to be paid for on acceptance."—*Lippincott's.*

A Fine Point

"Tell me," said the newly-rich lady, as they were discussing points of pronunciation, "do you say 'the Rhine' or 'the Rhone'? I hear it both ways."—*The Christian Register.*

Meaning Who?

"Some men," said Uncle Eben, "has a way of tellin' you to be good dat soun's like dey thought dey was improvin' on de Ten Commandments."—*Washington Star.*

Bully! Oh Very Bull-y!

Irish Policeman—"If ye want to smoke here ye'll have to aither put out yer cigar or go somewhere ilse."—*Princeton Tiger.*

The Reason Why

Young Bride—"I didn't accept Harry the first time he proposed."

Miss Ryval—"No, dear, you weren't there."
—*Boston Transcript.*

Striking Different People Differently

Servant—"Heavens, I have knocked the big flower-pot off the window ledge, and it struck a man on the head."

Mistress—"What! My beautiful majolica?"
—*Rire gende Blaette.*

FIRST STAGE IN THE CONSTRUCTION OF THE TWIN STEEL TUBE WHICH IS TO FORM THE RIVER SECTION OF THE LA SALLE STREET TUNNEL UNDER THE CHICAGO RIVER.

TUNNEL FURNISHED READY-MADE

BY ROBERT H. MOULTON

WHEN the new La Salle street tunnel under the Chicago river is completed Chicago will be the possessor of a novelty in the form of a tunnel built above ground and then sunk into place beneath the bed of the river. The method of its building is similar to that used in the great Detroit river tunnel. A huge steel tube, or rather twin tube, has been constructed in the yards of a dry dock company and, in a few weeks, will be ready to float down the river and put in position, forming a passageway for one of the city's street railway lines. Incidentally, the tunnel is to be made a part of Chicago's future subway system.

The double-barreled tube, which has been in course of construction since last July, is two hundred and eighty feet long, forty-one feet wide and twenty-four feet high. It is composed of more than five hundred sections of two inch steel. After it is put in place the tube will be lined with a two foot layer of concrete, a road bed built in each chamber and car tracks laid.

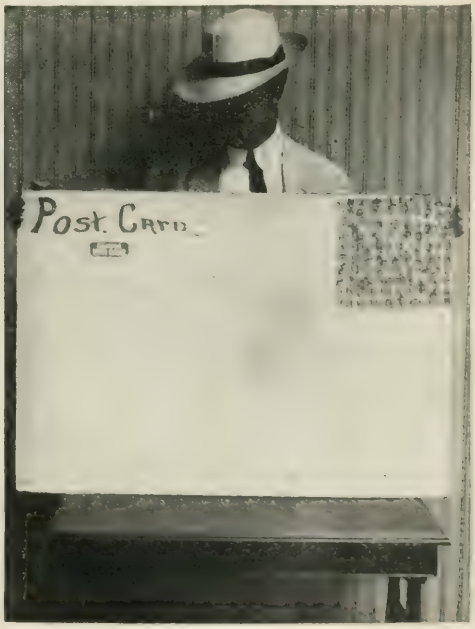
The tube will be conveyed down the river from the dry dock by tugs and barges and in order to facilitate the work the gates of the drainage canal at Lockport will be closed to stop the river current during the journey.

POPULAR · SCIENCE & MECHANICS SUPPLEMENT ·

HIT THE PADDLE

ONE of the cleverest amusement devices ever installed at a summer resort is shown in the accompanying photograph. The device is called "Hit the Paddle," and the object of attack is the paddle shaped affair which projects at the side of the scaffolding. One is provided with five base-balls and instructed to throw them at the large disc which forms the end of the paddle. When

PATIENT VICTIM OF PUBLIC FUN.
When the paddle is hit by a thrown ball, the colored man drops into a tank of water.



POST CARD OF GREAT SIZE.
This is said to be the largest post card ever passed through the United States mails.

To Prevent Rear Collisions.
Mechanical hand indicates to following vehicles when auto-driver is about to stop.

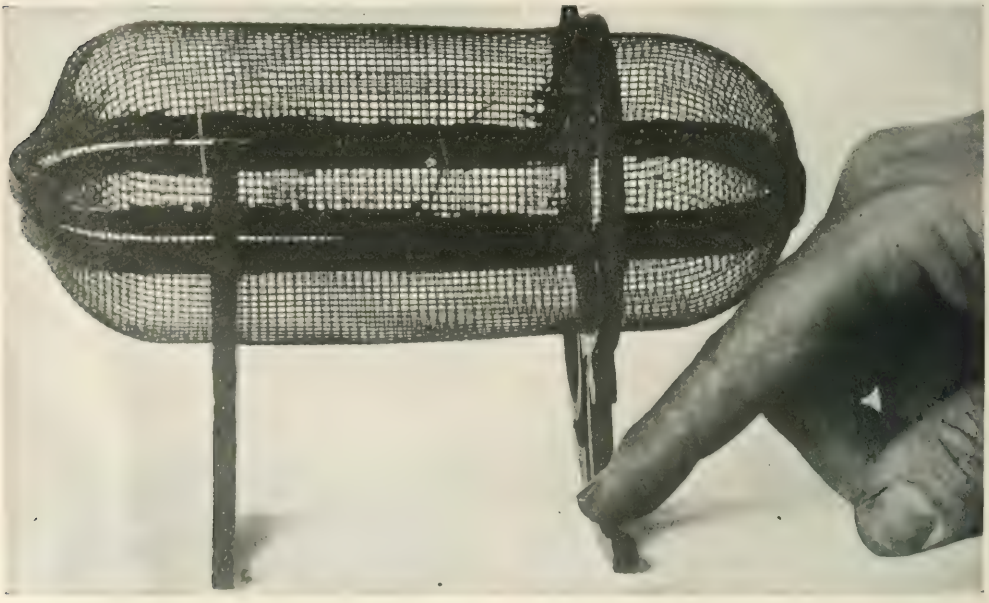
the disc is hit it springs a trap and the bar on which the darkey is sitting drops from under him. Of course, the colored gentleman falls with a great splash, landing in a canvas tank of sea water where he flounders about for a few minutes before scrambling out.

INGENIOUS DEVICE FOR DRIVERS

A MOTOR driver in the service of the London postoffice, more ingenious than his fellows, has just invented a mechanical arm, as shown in the photo. which is automatically set in position to indicate an expected stop when the brake is applied. This invention, simple as it is, is one of the greatest use to the motorman driving in heavy traffic and one that allows both his own hands to be employed on the steering wheel or with the driving gear at the time the arm is set to "stop."

FLYPROOF CRADLE FOR BABY

ONE of the oddest inventions in the collection preserved by the government at Washington is a fly-proof cradle, which is covered with wire net. The picture shows the original miniature model submitted by the patentee. The cradle is made in two halves, so that the upper part can be folded over and fastened, thus enclosing the child and rendering it safe against intrusion by buzzing insects. One might suppose that so good an idea would have met with popular favor, but, so far as known, no cradles of this ingenious pattern are in use today. Perhaps mothers find it too easy to protect babies by simpler methods.



STRANGE PRODUCT OF INVENTOR'S BRAIN.
A fly-proof cradle, consisting of a screen cage set upon rockers for convenience of mothers and safety of infants.

BUILDING MADE OF COAL

ONE of the original features of the Appalachian Exposition at Knoxville, Tenn., is a building made of coal. While it was erected to serve the ten year period of this once a year exposition, engineers say that a hundred years from now might see this building in good condition. The high grade bituminous coal mined in the Jellico district and sold extensively for domestic coal, has been used for building material. The Southern Coal Operators Association conceived this building for exhibiting Appalachian coals and it was under the direction of the association that it was built. Quite appropriately the structure spans the pathway leading to the Appalachian forestry and mineral building.

HAIR BALLS

THE photograph shows those curious formations that are known among farmers as "hair-balls." The two pictured were found in the paunch of cattle. There is a shell-like covering and hair inside. They vary in size, the largest being about two and a half inches in diameter. They are found in deer also, and, probably, in elk, caribou and moose. The tongues of

CURIOUS HAIR BALLS.
Odd formations found in the paunch of cattle, result of licking themselves.

cattle are rough—the further from the point, the rougher—almost as much so as a rasp. In licking themselves, especially in the spring, when many animals shed, the hair is caught on the rough tongue and swallowed, but how and why it becomes so round and covered, like the shell of an egg is a guess. It seems quite impossible for them to get larger and the only way to account for different sizes is in the amount of hair originally rolled into the ball. It is doubtful whether they are ever passed, per via naturalis, and are often probably the cause of some distress to the animal itself, if not of actual sickness.

A GENEROUS WELCOME HOME.
All the world loves a lover but nobody seems to love a newly married man, at least he is made the victim of all kinds of jokes. The accompanying photograph is of a cottage decorated for newlyweds.

LATEST IN MONORAILS.
Track in use on City Island, N. Y., showing the overhead work.

ARTIFICIAL LUMBER.
Embossed piece of imitation wood made from straw.

LUMBER MADE OF STRAW

MAKING bricks without straw once led to an uprising in ancient Egypt, yet this task seems simple compared with that of making lumber without wood. Nevertheless, in Barberton, Ohio, lives Oliver L. Barber, who won prominence and a competence by inventing laminated chair seats, labored to produce lumber from straw, finally achieving the desired ends. Now artificial lumber is being produced, and is being employed in many ways where wood was hitherto regarded as indispensable.

This artificial lumber varies in thickness from one-eighth of an inch upwards, and ranges from narrow moulding to boards four feet wide and twelve feet long. According to the inventor it can be impregnated with certain chemicals to render it fireproof, can be made waterproof, during manufacture can be permeated with any desired color, or can be given a highly polished surface finish. It is susceptible to all kinds of tool treatment, is free from knots and shakes with their consequent waste, and can also be used in embossing. The artificial lumber is made under special processes from straw board or directly from straw and from waste paper, opening up a wide range of possibilities in the matter of crude material that commands attention at a time when the question of building materials is coming in for such general consideration.

A WONDERFUL PLAY VILLAGE.
Remarkable town of miniature houses for amusement and instruction of boys, at Redhill, England, where the buildings are made of the same materials as full sized dwellings and furnished completely.

BALING AND LOADING AT ONE OPERATION.
Ingenious method of one farmer to provide for easy handling of his baled hay from machine to wagon.

GRANITE BY THE ACRE

IN quarries of vast areas a very interesting and economical process termed "lifting" is being used with ultimate success to quarry stone of great dimensions.

"Lifting" is accomplished by successive use of powder and compressed air. In the center of the area desired to be "lifted" a hole, two or three inches in diameter is sunk to a depth of six or eight feet, the depth depending on the greatest thickness desired for the stone being quarried. The bottom of this drill or "lift" hole is enlarged into a pocket by a small explosion of dynamite. A small amount of powder exploded in this pocket starts a horizontal crack across its greater diameter. This crack or cleavage is extended to a radius of 75 or 100 feet in all directions from the "lift" hole by additional charges of powder being exploded in the pocket, increasing in size and the drill hole being plugged at each blast to confine the gases and exert a constant force upon the stone.

A pipe, connected with the air compressor, is then cemented into the drill or "lift" hole and compressed air at about 80 pounds pressure is gradually admitted until the crack or cleavage, so

QUARRYING GRANITE BY THE ACRE.
How the great lifts of stone look after they are raised by compressed air and cut into sizes.

A WATER TRAIN.

One of the greatest difficulties in the building of that remarkable railroad across the Florida Keys, from Miami on the coast down to Key West, was the obtaining of fresh water. Even now the water is still carried over the line and deposited in the large reservoir at Knights Key.

forced, extends rapidly until it is visible in a thin edge out on the hillside.

Laminations or sheets of granite several acres in area can be raised in a single operation by this method.

NEW NOAH'S ARK STORY

CARL LUMHOLTZ, the well known explorer, has visited and reported on a wonderful and almost practically unknown tribe of Indians in Mexico. He found among them a remarkable legend, a new version of Noah's Ark and the Flood. This new interpretation of the deluge is not in keeping with the Biblical narrative. Besides the Ark never rested on Ararat at all, also Noah was not a Jew, and his name probably was not Noah. He was a Huichol Indian, and his story is part of the Huichol family history. His ark rested on one of the mountain tops of Central Mexico, and the flood was not merely a forty day affair, but lasted five years. The Huichols are a hermit people. Mr. Lumholtz believes he is the first white man, certainly first scientist, to penetrate and to live some time in their territory. There are some 4,000 of them and they live in an almost inaccessible canyon or narrow defile in the Sierra Madre Mountains in the state of Jalisco.

NOAH'S REAL DESCENDANT.

Members of strange Huichol tribe of Indians who have a curious myth that parallels the Biblical flood story.

A ROW OF BRITISH DESTROYERS.
One of the indications that world peace is still a long way off is the constant construction of new vessels like these.

HOUSE NUMBERS ON THE CURB

A NEW system of numbering houses is being tried out in Pasadena, California, with great success, the city having employed a number of painters to stencil house numbers upon the curb. The object of this innovation is to make it possible for drivers of delivery wagons and others to locate a house without having to enter the yard, a great time and money saver for the merchants who employ the delivery men. The numbers are very conspicuous, being one and a half inches high, stenciled in black upon a ground of white. The city has painted the names of the streets on the curbs.

A CONTRAST

IT is a common complaint throughout Latin-America that American manufacturers do not pay sufficient attention to packing their goods. In many instances they have lost duplicate orders because of carelessness in shipment. German manufacturers on the other hand are very particular and take extraordinary pains to crate articles shipped from all danger of injury in transit. The photograph shows rolls of paper consigned to newspapers which have just been unloaded on the dock at Valparaiso, Chile. They are carefully wrapped around with boards. American manufacturers wrap the rolls with paper only.

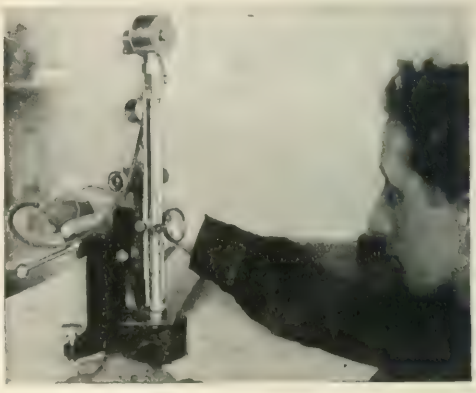
HOUSE NUMBERS ON THE CURB.
Helpful method of indicating addresses used in Pasadena.

A LESSON FOR AMERICANS.
How German manufacturers pack rolls of paper for shipment to South America.

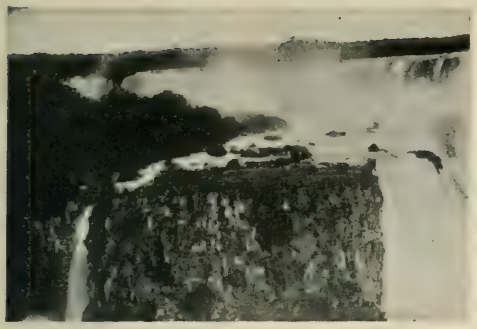
Medicine Hat's Big Gas Well.
Spouter flowing at rate of 3,000,000 cubic feet per day, as it formed before closing for use.

HOW HARD IS IT?

THE average manufacturer has been satisfied, heretofore, after tempering a tool to find it hard enough to resist a file; however, a tool may have been overheated in hardening, thus reducing its per cent. of carbon and making it more liable to breakage, as well as less able to hold a keen edge, while its ability to resist a file would be the same. The scleroscope, a new invention, indicates the quality of steel before and after hardening, so that any error in its manufacture is very quickly detected. Tool steel must be annealed, or softened to a certain degree before it can be economically machined. The scleroscope indicates at once whether the piece is soft enough to be properly worked. In the manufacture of large quantities of duplicate parts therefore, this instrument is of tremendous value. The machine consists of a small weight or drop hammer sliding in a glass tube and held at a certain height by hooks which are released by the pressure of a rubber bulb acting upon a specially designed valve. The drop is equipped with a conical diamond point and though of itself, the drop weighs but forty grains, it gains sufficient momentum in falling to strike a blow equal to one hundred pounds to the square inch. This pressure is again tremendously multiplied when it is considered that the area of the point is but 1/2500 part of a square inch, and that in testing hardened steel only about one-half of the point can penetrate the surface because of its conical shape. We have, therefore, 1/5000 of a square inch multiplied by the measured impact of one hundred pounds, giving us a pressure of 500,000 pounds to the square inch exerted by the instrument on hardened steel. As the degree of hardness is measured by the rebound of the drop after striking the piece tested, it is necessary that the point should be of a conical shape in order that it shall slightly break or penetrate the surface; otherwise the rebound might in part indicate the surface elasticity. The height of the rebound is indicated upon a scale.



How Hard Is It?
Using the scleroscope for testing hardness of metal.



BRAZIL'S NIAGARA.
Magnificent falls of South American river that rival our own great cataract.

NIAGARA OF BRAZIL

BRAZIL is a land of waterfalls, but it is doubtful if the average reader could recall the name of even one. And yet that republic contains within its borders no less than four cascades which have been likened in grandeur to our own Niagara. The greatest falls in Brazil, Iguassu, occur on the rivers which are tributary to the Rio de la Plata, the river of silver, as the name would indicate. A dozen miles away, if the day is clear, the smoking columns of mist which crown the falls are plainly visible. In appearance the falls are very similar to those of Niagara, with an acute horseshoe bend on one side. They may be divided into two sections also, the Brazilian and the Argentine falls, for this river is the boundary line between the two republics. The entire falls approximate fully two miles in length. There is a triple leap, the final one being two hundred and thirteen feet. Below this final cascade there are depths which a hundred fathom line have failed to sound, and the natives believe them to be bottomless. During the rainy season, which lasts about half the year, the volume of water passing over these precipices is almost incredible, being far in excess of that at Niagara, because the rainfall is so much greater in this semi-tropical land.

Iguassu is like a greater Niagara set out in the midst of a wilderness, with dense lines of bamboo and other trees marking the boundaries of the stream. It still remains in all its pristine loveliness, for the destructive hand of man can hardly be seen in its vicinity.

ELECTRICITY FROM THE RIVER JORDAN

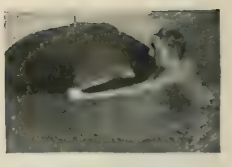
IT may seem sacrilegious but nevertheless a company is being formed to build a light and power plant at the falls of the Jordan between Meron and Lake Gallilee. The river at this point makes a descent of 700 feet and it is planned to build the plant large enough to supply all of the large towns of Palestine.

TEACHING POLICE REMARKABLE STUNTS.
One of the feats practised in New York night school for future "coppers."

Two of These Air-Filled Balloons Would Support You in the Water.

Child's Rubber Ball May Support a Man.

A Dress-Hat is not Half-Bad as Temporary Dependence.



An Umbrella, Properly Handled, Makes a Life Preserver.

An Inverted Pail Will Hold Air Enough to Keep You Afloat.

ORDINARY ARTICLES USED AS LIFE PRESERVERS.

Useful hints in photographs are here presented to suggest the large number of articles that may be used to prevent the sinking of a person who has fallen into the water accidently and who is unable to swim. When regular life-saving apparatus is not at hand, any one of these things would keep the unfortunate afloat till help arrived.

HOSPITAL FOR FISH

THERE has recently been annexed to the New York Aquarium a service of surgery and medicine for fish. The wards of this picturesque aquatic clinic are furnished with basins in which to isolate the sick or convalescent.

It has been proved that salt water baths cure the maladies of fresh water fish. A carp or sick trout recovers its health quickly if placed for a few days in salt water, and vice versa, a little cure of fresh water is just as effectual for the sea fish. Fungus excrescences caused by bruises the fish receive in beating against the glass, etc., are thus removed.

An Ordinary Bicycle Tire Might Save a Person from Drowning.

FARMING TAUGHT BY MAIL

THE Kansas Agricultural College, with the idea of making itself directly useful to the whole State, has decided to offer the following correspondence courses for the benefit of those who are interested in new lines and wish to study in spare time: Elementary agriculture, soils, vegetable gardening, farm dairying, stock feeding, highway construction, poultry management, cooking, sewing, farm crops, landscape gardening, farm drainage, forestry, farm animals, farm buildings, farm economics, and insect pests. This helps those who must stay at home.

SURGICAL OPERATIONS UPON FISH.

New methods at the New York aquarium are saving the lives of many finny sufferers. The pictures illustrate the use of surgeons' instruments to relieve characteristic troubles.

TOWER MADE FROM TREE.
This structure stands in Washington and is made of the bark of one Sequoia tree, forty feet in circumference.

NEW POLE FOR WIRELESS

THE ease of transport required in a military wireless telegraph station is ensured only imperfectly by the use of antenna poles made up of unmountable bamboo or metal rods. A most ingenious solution of the problem is afforded by the extensible metal poles recently invented by Mr. Casanova of Paris. The base of the foot contains a number of double steel tubes constituting the extensible pole. In the frame resting upon this is contained a winch, and above this is located a pole-guide. The outside tube is a spiral coil of iron wire, the windings of which are constantly in contact with one another. This tube contains another tube made up in exactly the same manner.

The winch is operated by a hand crank, the axle of which terminates in a worm gearing with a toothed pinion. On the axle of the latter is mounted a toothed wheel which carries along another toothed wheel of equal diameter. The axis of each wheel carries a slotted pulley in which the windings of the coil tube are guided during their motion. A ring is attached at the end of the extensible pole in order to keep the various tubes together. By turning the handle of the winch, the pole is extended, the various tube section rising one after the other.

GOOD STREET-MARKING.
Clever and artistic scheme for lamp-post bearing iron street name-sign.

MONKEY LOVES RABBITS.
Curious friendship developed by Simian for domestic pets in Los Angeles bird-store.

NEW PORTABLE POLE FOR WIRELESS TELEGRAPHY.
Remarkable invention of a German for the ready transportation of apparatus suitable for sending messages through the air.

FREAK GROWTH OF TREES.
Lombardy poplar growing between the forks of a cottonwood near Santa Fe, N. M.

FREAK TREE IN NEW MEXICO

OF freak trees few are more remarkable than the tall cottonwood shown in the accompanying illustration. It grows by the roadside, near what is known as the Bouquet Ranch, about twenty-five miles northwest of Santa Fe. The cottonwood forks about fifteen feet above the ground; and between the forks has grown a tall lombardy poplar. Old timers in the neighborhood say they can remember the freak tree for nearly forty years, when it was, of course, very much smaller than now, but the lombardy poplar was in place even then, with no one able to explain how it got there. It is conjectured by some that it must have been grafted between the forks of the cottonwood by some practical joker desirous of mystifying the wise men of the neighborhood.

WIRING A WEAK AORTA

TO watch the surgeons coil thirty-two feet of wire into the walls of his aorta was the remarkable experience of Robert Campbell, formerly an engineer on the Salt Lake Railroad. When brought to the hospital in October the patient was told by the physicians that he could not live until Christmas as he was suffering from an aneurism or weakening and rupture of the aorta, the large artery leading directly from the heart. In the hope of saving his life this remarkable operation was performed of inserting aluminum bronze wire in such a way that it would coil within the walls

NOVEL OUTDOOR ELECTRIC EXHIBITION.
Rhode Island Y. M. C. A. adopts an odd method of interesting possible students by free open-air lectures and demonstrations from an automobile.

of the aorta extending down to within an inch of the heart and up beyond the diseased portion of the aorta. This feat was accomplished without the aid of anaesthetics, and the patient not only watched the four surgeons who attended him but actually helped coil the thirty-two feet of wire which was inserted. The size of the wire when coiled like a spring was nearly as large as a small football and the clotted blood forming around this coil was expected to develop into tissue.

A BURDEN OF RICHES

THE heavy squares of copper shown in this photograph are real money bearing the royal mint mark, although it is about the last thing they would be taken for. They are specimens of the famous Swedish plate money and are dated 1724. The value of this strange coinage is comparatively small in proportion to its great weight and bulk. The largest of the three is a four-daler piece which, at that time, had the value of four silver dalers, though the purchasing power would be equivalent to about $10 at the present time. This clumsy rectangle of copper weighs six and a half pounds, the smaller one, a one-daler piece, weighs one and a half pounds and the smallest of the three, a half-daler, weighs three-quarters of a pound, so it can be readily seen that a millionaire in those days would have had to build a series of warehouses for his money. The value of the four-daler piece among coin collectors is about $25. These coins form part of one of the finest private collections in the West.

RICHES A POSITIVE BURDEN.
Remarkable form of coins used in Sweden early in the eighteenth century.

ENGLISH WOMEN VOLUNTEER TO SERVE IN HOSPITAL CORPS.
An organization has been formed by women in Britain, that pays its own expenses and holds itself subject to the government's call, for aid in military hospital work.

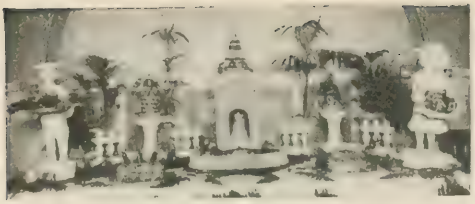


TABLE FULL OF REMARKABLE CREATIONS.
One triumph of a clever chef in preparation for a banquet.

ANOTHER FINE DECORATIVE SCHEME.
Wax-work of most elaborate sort that ornamented a festive board.

A SHIP IN WAX-WORK.
Chef's little masterpiece built of plastic material, simply to show skill.

CENTER PIECE FOR DINING TABLE.
Combination of wax and sugar is worked into artistic statuette and pedestal, with pheasants mounted at sides.

ROSES IN ICES.
Wax model of chef's plan for confections.

FINE WORK OF CHEFS

NO class of workers take greater pride in skill of fingers than the professional chefs of the big hotel kitchens. On this page are illustrated a few of the triumphs of men who follow this calling and who have made wide reputations in this line of work. The models for decorations and for dishes are made usually in wax, though sugar is sometimes employed, with natural leaves and birds of handsome plumage as ornaments.

HANDSOME WEDDING CAKE.
Huge design in wax made as model of the cake to be, with wedding-bell, cupid and billing doves as ornaments.

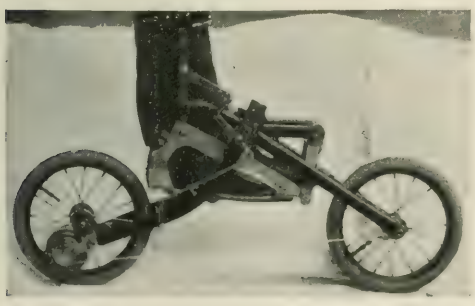
Monorail Car in Transit.
New form of vehicle for single rail track now in use on Long Island experimental road.

MANILA'S STEEL CHURCH

THE San Sebastian, of Manila, better known locally as the steel church, is a drawing card for tourists. It is constructed of steel throughout, excepting that the altars and confessionals are of fine Philippine hardwoods. The walls are but one-fourth of an inch in thickness and have no interior lining. The structure was made in sections in Europe and was shipped, "knocked down," to the islands.

Manila's Steel Church.
Sacred edifice built entirely of metal in Europe and shipped "knocked down" to the Philippines.

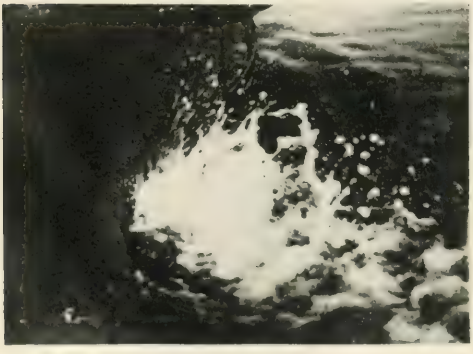
A New Krupp Design.
Small field gun for firing bombs that asphyxiate the enemy.



NEW SORT OF SEVEN-LEAGUE BOOTS.
German device in form of roller-skates that propel themselves, when weight of the wearer is upon them, by means of combination of levers and springs. It is claimed that rapid progress can be made with them on smooth roads.

A Pailful Doesn't Even Bother It.

A Bath in a Box Hurts It Not at All.



Plunging Into Open Water Does Not Drown It.

Dropped Over a Ship's Side It Keeps on Doing Business.

Flood and Foam Cannot Kill Its Usefulness.

Complete Submersion Does Not Stop Its Action.

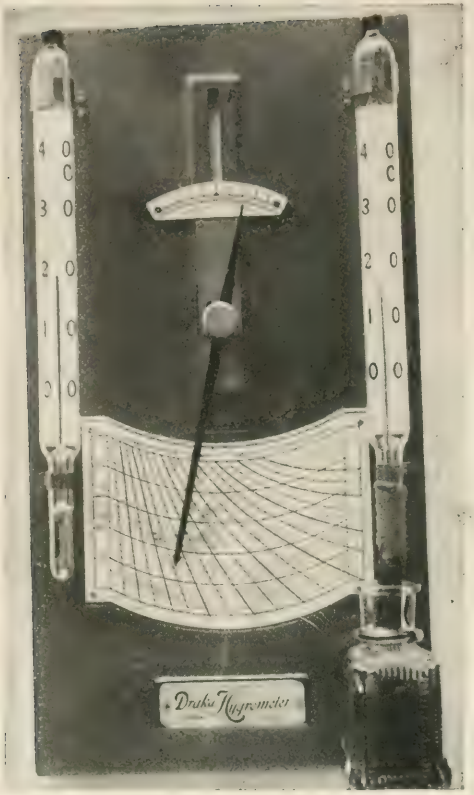
REMARKABLE SUBMERGIBLE MOTOR.

Efficient little machine for under-water use that cannot be "drowned" by pouring upon or dipping or by complete sinking beneath the surface.

FREAK FORM OF MOTOR SNOW-PLOW.
Berliners have a new scheme for clearing city streets of the white blanket.

HOME OF THE HUICHOLS.
Village of the Mexican Hermit Indian Tribe, described last month, whose methods of housekeeping are primitive.

THE LATEST IN MEXICAN SILOS.
Well built but oddly formed containers used by Mexicans for storage of fodder for cattle.



New Form of Hygrometer.
Invention for ready determination of moisture in the atmosphere.

NOVEL HYGROMETER

THE only instrument for determining the moisture of the air that may be said to give reliable results is the Psychrometer. Owing, however, to the fact that this instrument is dependent on the use of special tables, it has so far been employed only in scientific laboratories, whereas direct-reading apparatus, in spite of their undoubted inferiority, have been resorted to wherever hygrometric data were required for industrial purposes.

This is why the problem of designing an accurate hygrometer allowing the moisture of atmosphere to be ascertained by direct reading has been frequently discussed of late years. Dr. A. Katz of Wurttemberg has set himself the task of making of the familiar Psychrometer a direct-reading instrument. The apparatus represented in the photograph embodies the outcome of his endeavors in this direction.

The instrument, as represented, comprises two accurately agreeing psychrometer thermometers. The mercury vessel of one is kept moist by a water bottle suspended underneath and in which a sleeve surrounding the mercury is immersed. This moist thermometer, according to the above, records a temperature lower than the dry thermometer, the difference of reading being the more considerable as the air is drier. In order then to ascertain the relative moisture corresponding to a dry thermometer reading of ten degrees centigrade and a moist thermometer-reading of eight degrees centigrade, the pointer should be turned round by means of the knob, until its upper end will point to the difference of ten and eight or to two, after which it is displaced in a vertical direction until its lower end will coincide with the ordinate circle eight. The curve next to which the lower end of the pointer thus is made to point then indicates the relative moisture of the air, in the present case, seventy-five per cent.

TO BURN NO COAL

FOLLOWING several months of experimentation on the Puget Sound-Portland Division of the Oregon and Washington Railway, the Harriman roads officially have determined to throw

Live Baby Musk-Oxen.
Newly imported curiosities at the New York Zoo, which came from Greenland, and are the only ones of their kind.

JAP WATER-PROOF KNAP-SACK.
Horse-hair case for soldiers of the Mikado, with canteen and extra shoes attached.

out the coal-burning engines, and hereafter use only liquid fuel.

The quality of the fuel that has been palmed off on the Western railroads has been a big factor in bringing the Oregon and Washington roads to an oil burning basis, and they believe that oil will successfully answer all purposes.

The matter of reconstructing the experimental coal burning engines now in use by the roads in both Oregon and Washington, will require some time. Several engines have been completed.

BAMBOO FOR PAPER-MAKING

THERE appears to be no room for doubt that bamboo is one of the most promising, if not in fact actually the most attractive of the new sources of paper stock available at this time. It has no bark, it is much easier to treat than wood on account of the capillary sap tubes. The yield on the commercial scale is about forty-five per cent. of bleached fiber, while the average yield per year per acre is five tons of bamboo.

CORNER IN WHALEBONE

PRACTICALLY every pound of that most indispensable article, whalebone, is stored away in a small, three-story building in New Bedford. There are only about 100,000 pounds of it, yet this precious store represents the whalebone supply of the entire world! This cornering of the whalebone product is the enterprise of Edgar R. Lewis, a New Bedford young man who knows the whaling business from beginning to end and he has the whalebone phase so intricately and carefully planned that through agents in Paris and other sources, he secures control of every pound that is taken. All of that from the Arctic, the Northwest and the small quantity supplied from the Pacific Coast of South America and the catch of the Dundee whalers he gets. He is the one man with whom all the buyers of America and Europe have to deal.

$10,000 WORTH OF WHALEBONE.
Part of the stock of the man who has, and continues to hold, a corner on this useful and valuable commodity.

Self-Dumping Barge.
Tank at top is filled with water and so makes barge top-heavy when a dump is desired.

Securing Mexican Drink.
Drawing the juice of the Agave plant which is fermented to make mescal.

Primitive Mescal Distillery.
Where famous drink of the Mexicans is made in simple fashion by simplest of methods.

Fermenting Pulque.
This drink of the Mexicans is made in bull-hide vats, shown at both sides of the room is this picture.

NOVEL SELF-DUMPING BARGE

VARIOUS and many have been the efforts of inventors to devise a more serviceable method of self-emptying barges than that so extensively practised today, by opening the bottoms. The range of such is strictly limited, they are expensive both in first cost and maintenance, and the dimensions of individual portions of the contents must not exceed the limits of the opening doors in the bottom. It is for this reason that the recent invention of a Swedish shipbuilder and engineer, Mr. A. F. Wiking, has aroused considerable attention, inasmuch as the apparatus complies with all the requisitions for a craft of this class, and the system is very simple. The craft is of the ordinary type, but discharging is effected by the simple means of suddenly upsetting the vessel's equilibrium causing it to cant over and thus shooting its contents into the water. This disturbance of equilibrium is ingeniously carried out. There is a long cylindrical tank mounted the length of the barge some feet above the deck and above one side, as is shown in the illustration. Beneath the deck on the opposite side to the elevated cylinder, and so arranged as to come at the lowest point of the hull, is another similar tank. This hull tank is normally filled with water, and keeps the barge on an even keel.

When the barge is loaded, with 200 tons of rock, and the site for dumping has been gained, a valve is opened and compressed air contained in another tank in the hull is admitted into the underdeck water-tank. The compressed air drives the water out of the lower tank into the elevated cylinder causing the craft to become top-heavy, so that it heels over, and as the deck is inclined the contents are shot off into the sea. It requires only a slight inclination of the deck to cause the spoil to slide off, as there are no bulwarks holding the rock in position on the deck, or at least only doors hinged at the bottom which fall down as the vessel cants. Consequently, instantly the load has been shot, and the compressed air has been cut off, the water in the upper cylinder commences to flow back into its former tank by gravity, the balance of the craft is restored.

ODDITY IN CONCRETE

THE artistic grape arbor shown in this illustration was made of concrete by Mr. Felix Goebeler of Upper Alton, Illinois, who furnishes the details of this novelty in cement work. This arbor is quite as artistic as any similar wooden structure and of course there is no danger of the posts rotting away or warping out of shape.

ODDITY IN CONCRETE CONSTRUCTION.
Arbor trellis built of the material has both beauty and permanence.

TRACK GRADING MACHINE

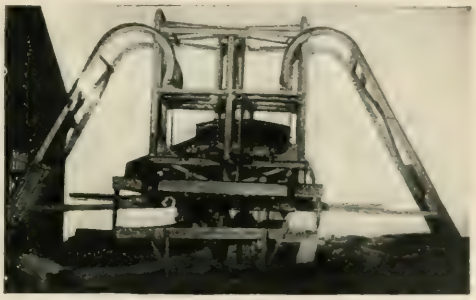
A W. SNOW, a Duluth, Minn., railroad builder, has recently invented a large track grading machine that promises to largely revolutionize the operation of contractors.

The purpose of the Snow machine is to grade and ballast track, doing the work of the lifting jacks and gangs of shovelers and tampers. It is designed to build embankments without the use of trestles. The general plan of its operation is that it runs out a temporary track laid on the fill, picks up a section of track, draws earth in from the sides of the roadbed beneath the ties, and tamps it there. It then backs to raise another section, and so proceeds to raise the track by stages, going back and forth over the same ground, until the proper elevation has been reached.

TRACK GRADING MACHINE.
Device for contractors that handles heavy work in swift fashion.

CLEANING ASPHALT STREETS

A NOVEL method of street cleaning being demonstrated in New York, consists in scrubbing the asphalt pavements with a new machine called a "squegee." This is a small, low wheeled water tank having attached at the rear a rotary roller in which long strips of soft rubber are inserted with a partial twist, like the blades of a lawn mower. One end of this roller, or scrubber, is connected by a driving chain to a sprocket on a rear wheel so that as the cart is drawn forward the scrubber revolves backward. The scrubber is placed at an angle so that the sludge is carried out at the right end. Water from the tank is sprayed on the pavement in front of the scrubber to loosen the dirt. The roller's weight forces the soft rubber down into all ordinary inequalities of the street surface and leaves it clean.



GRADER IN OPEN POSITION.
This machine performs all the operations better than a gang of men can do them.

SQUEGEE FOR THE STREET.
Novel machine used in New York for washing pavements as windows are washed.

SPECTACULAR WRECK.
Strange plight of *S. S. Princess May* near Juneau, Alaska.

AUTO FOR EXPLOSIVES

A MANUFACTURER of ammunition has adopted an electric wagon having a compartment designed for holding and transporting powder and dynamite. The compartment, when closed, is practically hermetically sealed, making it impossible for anything to enter which would cause an explosion. The compartment is arranged so that jars to its contents are impossible.

NEW AUTO DYNAMITE CARRIER

SPECTACULAR WRECK

ON the night of August 5th, 1910, the Canadian steamship *Princess May* ran ashore on Sentinel Island, in the vicinity of Juneau, Alaska, during a dense fog. At low tide the vessel presented a spectacular appearance, being almost entirely out of water and with almost one-half of the hull overhanging across a jagged reef. Had she not been of remarkably staunch construction, she would have buckled up like a piece of paste-board. Wreckers were at once dispatched to her assistance. The holes in the hull were patched with concrete, portions of the ledge were torn away with dynamite, and the vessel cleared of water by the use of huge centrifugal pumps. At high tide two wrecking steamers succeeded in pulling her from her perilous berth, and she is now in dry-dock, where a survey of the damage is being made. Forty plates will have to be renewed, the total damage being rated in the neighborhood of $100,000.

NEW TRACTION CULTIVATOR

THE special feature of the traction cultivator illustrated herewith is in practical use is the turning principle. By the operation of a single lever, the machine may be started, steered along the row and a direct turn made by locking either wheel, while the other continues to run. This aids in solving the problem of traction engines being made veritable "farm horses."

NEW TRACTION CULTIVATOR.
Machine that carries its own motive power and turns in its own length promises to be a very valuable improvement in farm implements.

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